School of Psychology

Investigating Associations between Health Behaviours, Constructs of the Job Demands-Resources Model, and Work-Related Outcomes

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Declaration

To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgement has been made. This thesis contains no material which has been accepted for the award of any other degree of diploma in any university.

Human ethics. The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research studies (detailed in Chapters I-V) received human research ethics approval from the Curtin University Human Research Ethics Committee (approval number: RDHS-271-15).

Signature: 

Date: 04/10/2018

Abstract

Background and aims: Employee health is essential for workplace well-being and is known to be associated with organisational outcomes such as work engagement. Health behaviours are important determinants of health, yet have received inadequate attention within the organisational behaviour literature. *Health behaviours* refer to activities that may either promote health (e.g., adequate physical activity) or increase the likelihood of risk to health (e.g., tobacco consumption). Research on workplace well-being suggests that risky *employee health behaviours* (e.g., high alcohol consumption) are associated with negative indices of physical (e.g., risk of hospitalisation) and mental health (e.g., depression), as well as negative work-related outcomes (e.g., burnout). Conversely, employee behaviours that promote health are associated with positive physical (e.g., good cardiovascular health) and mental health (e.g., positive affect), and positive work-related outcomes (e.g., work engagement). The objective of this doctoral research was to enhance understanding of the role of *health behaviours* in the context of work-related well-being. The *job demands-resources (JD-R) model*, a widely used framework of employee well-being was selected as an organising framework for this project (Demerouti et al., 2001a, 2001b). The objectives were achieved by scoping the literature on what is currently known about the associations between *employee health behaviours* and constructs from the *JD-R model*; by identifying employee typologies of job demands and resources and examining their differences on *health behaviours* and workplace constructs; and by examining the dynamic associations between employee *health behaviours* and *JD-R model* constructs.

Method/design: Three studies were conducted to examine the role of a number of *employee health behaviours* (i.e., physical activity, sedentary behaviour, fruit and vegetable consumption, sleep, alcohol consumption, tobacco consumption) to selected constructs (i.e., job demands, job resources, personal resources, burnout, engagement) from the *JD-R model.* Guided by the methodological framework of Arksey and O'Malley (2005), the first study provided a narrative synthesis on what is known about the associations between *employee health behaviours* and the model constructs through a systematic scoping review. The second study used a cross-sectional survey design (N = 399; *Mage* = 44.38 years; *SDage* = 12.79 years; 266 [66.67%] females) to identify employee profiles based on job

demands and (job and personal) resources and explored how these differed on *health behaviours* and burnout and work engagement using a person-centered approach (i.e., latent profile analysis). The third study used a daily diary design (N = 71; *Mage* = 44.66 years; *SDage* = 12.96 years; 46 [70.70%] females) over a 2-week period to test two alternative models to examine whether the *health behaviours* office-based employees engage in are distal and/or proximal outcomes of constructs contained within the *JD-R* using multilevel modelling.

Results: The first study revealed only nine studies that have examined employee *health behaviours* and *JD-R model* constructs concurrently. The results showed there is currently limited evidence for the association between *health behaviours* and *JD-R model* constructs, with only two studies demonstrating significant associations. The results of the second study revealed three distinct employee profiles (i.e., 'minimally resourced', 'balanced' and 'resourceful') based on job demands and job and personal resources, and revealed differences in *health behaviours* and *JD-R model* constructs. In terms of *health behaviours*, all employees across all profiles engaged in combinations of both health-enhancing (e.g., MVPA, longer sleep duration) and health-impairing behaviours (e.g., tobacco and alcohol consumption), with a tendency for employees reporting the greater well-being levels engaging in more health-enhancing and fewer health-impairing behaviours. Furthermore, the cluster solution highlighted the importance of personal resources in the protection against burnout, and promotion of work engagement. The results of the third study suggested that employee *health behaviours* are proximal, rather than distal, outcomes of *JD-R model* constructs. When modelled as distal outcomes of *JD-R* constructs, only one association was found at the between-person level. Individuals who reported high levels of burnout over the study period also reported great sleep quality. Conversely, when modelled as proximal outcomes of *JD-R* constructs, a number of associations were revealed at both the between- and within-person levels.

Conclusions: The series of studies enhance conceptual and empirical understanding of the associations between employee wellbeing and a range of *health behaviours*. The findings of this doctoral thesis provide a valuable starting point for researchers interested in refining *JD-R* theory to

take into account *health behaviours*, and may inform organisations seeking to create or enhance work well-being initiatives.

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CHAPTER I: EMPLOYEE HEALTH AND HEALTH BEHAVIOURS IN THE CONTEXT OF WORK: REVIEW OF THE LITERATURE

Employee health is an important consideration for organisations as evidenced by the number of studies focusing on strategies to promote workplace health and well-being (e.g., Justesen, Eskerod, Christensen, & Sjøgaard, 2017; Malik, Blake, & Suggs, 2014; Tetrick & Winslow, 2015). Also considered a sub-dimension of employee well-being, employee health includes both psychological (e.g., anxiety, or positive affect) and physiological indicators (e.g., increased blood pressure, or reduced cortisol levels; Dana & Griffin, 1999). Some of the most widespread physical health problems in Australia include obesity, type 2 diabetes mellitus, cardiovascular health and cancer due to their contribution to the burden of disease (National Health and Medical Research Council, 2016). The workplace is an ideal setting in which to promote and protect individual health (Australian Public Service Commission, 2014). However, little remains known about how health behaviours are associated with employee well-being, constructs of the psychosocial working environment (e.g., job demands; McCarthy, Perry, Harrington, & Greiner, 2015) and work-related outcomes (e.g., work engagement; Schopp, Bike, Clark, & Minor, 2015). The majority of existing research has explored negative health outcomes (e.g., regional musculoskeletal pain) and risk of mortality associated with job strain (e.g., Habibi, Poorabdian, & Shakerian, 2015). Although some past evidence has revealed associations between job strain and health-impairing behaviours (e.g., smoking, physical inactivity; Kilpatrick et al., 2017; Pescud et al., 2015), the understanding of the role of health behaviours in the context of work-related well-being remains limited and largely atheoretical.

The Job Demands-Resources Model

In order to investigate employee well-being in the context of work, the job demands-resources (JD-R) model (Demerouti, Bakker, De Jonge, Janssen & Schaufeli, 2001b; Demerouti, Bakker, Nachreiner & Schaufeli, 2001a) was identified as a relevant theoretical framework. The JD-R is considered to be one of the leading models in the stress literature (Borst, Kruyen, & Lako, 2017). Building on previous influential stress models such as the effort–reward imbalance model (Siergist, 1996) and the demand-control model (Karasek, 1979), the JD-R model is based on three propositions.

The first proposition of the model is that across all occupations, job characteristics can be classified into one of two categories – job demands and job resources. Job demands are considered the social, organisational, and physical aspects of work that require effort and are therefore associated with psychological or physiological costs (e.g., emotionally taxing interactions with clients; Bakker & Demerouti, 2017). Conversely, job resources refer to aspects of work that are functional in achieving work goals, stimulating growth, or reducing the costs associated with job demands (e.g., opportunities for growth; Bakker, 2011; Bakker & Demerouti, 2007). The second proposition of the model is that job demands and job resources trigger two (relatively independent) processes – the health impairment process and the motivational process, respectively (Schaufeli & Bakker, 2004). In the health impairment process, long-term exposure to increased job demands are taxing on employee resources (psychological and physical) which in turn lead to exhaustion and subsequent health problems (Demerouti, Bakker, Nachreiner, & Schaufeli, 2000; Demerouti et al., 2001a, 2001b). In the motivational process, job resources are assumed to offer motivational potential that may lead to high work engagement, low cynicism, and meeting of performance standards (Bakker & Demerouti, 2007; Bakker, Van Veldhoven, & Xanthopoulou, 2010). On the contrary, insufficient job resources lead to reduced employee motivation or disengagement (e.g., Hansen, Sverke, & Näswall, 2009; Xanthopoulou et al., 2007). The third and final proposition of the JD-R model is that the interaction between job demands and job resources is important for predicting occupational health and well-being. Specifically, job resources can attenuate or buffer the effects of job demands on job strain, including burnout (also known as "buffering hypothesis;" Bakker, Demerouti, Taris, Schaufeli, & Schreurs, 2003; see Figure 1.1).

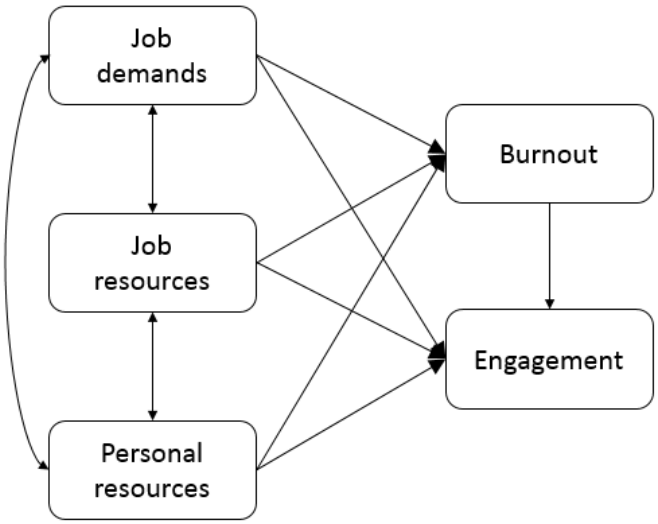

Figure 1.1. The job demands – resources model.

The JD-R model propositions are empirically supported and its popularity renders its use as a theoretical framework suitable for studying employee health and well-being in the context of this doctoral project (e.g., Kuykendall & Tay, 2015; Tremblay & Messervey, 2011). Research evidence has shown support for the health impairment and motivational processes (second proposition) (i.e., job demands predict exhaustion, and job resources predict engagement, respectively; Hakanen, Schaufeli, & Ahola, 2008) and the dual pathways have been associated with a broad range of outcomes in cross-sectional (e.g., Bakker, Demerouti, De Boer, & Schaufeli, 2003) and longitudinal studies (e.g., Schaufeli, Bakker, & Van Rhenen, 2009). For example, Schaufeli and colleagues (2009) longitudinally investigated how changes in job demands and job resources predicted burnout, engagement and sickness absence (N = 201). The study results confirmed the dual pathway of the JD-R model and showed that burnout (occurring as a result of increased job demands and decreased job resources) positively predicted duration and frequency of sickness absence. Consistent with this finding, results of another cross-sectional study in a sample of nursing home employees (N = 121) indicated that high job demands (operationalised as role overload) significantly increased the incidence of both absenteeism and presenteeism (Schneider, Winter, & Schreyögg, 2017). Besides the

dual processes of the model, studies have supported the proposed interactions between job demands and resources.

Gaither and Nadkarni (2012), for instance, cross-sectionally examined the interactions between job demands and job resources and their associations with a number of work-related outcomes (e.g., organisational commitment, burnout) in a sample of pharmacists (N = 1,874). Pharmacists were given one of four scenarios assimilating a high- or low-demand interaction with a physician that was either pleasant or unpleasant (i.e., high-demand/pleasant encounter, high-demand/unpleasant encounter, low-demand/pleasant encounter, low-demand/unpleasant encounter). A high-demand scenario was characterised by high job demands (e.g., work overload operationalised as the hospital having a full census) and low job resources (e.g., low social support from colleagues operationalised as fellow pharmacists and technicians having called in sick). A low-demand scenario was characterised by low job demands (e.g., low decision latitude operationalised as few patients requiring complex therapies) and moderate or high job resources (e.g., high social support from colleagues operationalised as pharmacists and technicians being in good spirits). In line with JD-R theory, the results showed support for the interaction between high demands and low resources (i.e., high demands and unpleasant encounters on-the-job were associated with lower levels of resources) and revealed positive associations with negative work-related outcomes (i.e., a positive association with frequency and intensity of emotional exhaustion, and a negative association with organisational commitment). Evidence for the proposed buffering hypothesis (i.e., job resources buffering the negative effects of job demands on strain) has also been found across different occupational samples employing cross-sectional study designs (e.g., Gauche, De Beer, & Brink, 2017). Although a considerable amount of research has supported the JD-R's assumptions and has shown the model to predict burnout and work engagement, there remain certain unresolved issues (Janse van Rensburg, Boonzaier, & Boonzaier, 2013; Müjdelen & Özgün, 2013). For example, some studies have shown links between variables involved in both the motivational (e.g., job resources) and health-impairement (e.g., burnout) processes (i.e., job resources x burnout) suggesting the two model processes are

different but possibly related (and not completely independent from one another as previously thought; Schaufeli & Bakker, 2004).

A more recent addition to the JD-R model includes personal resources which are hypothesised to interact (either independently or in combination) with job resources directly promoting work engagement (Bakker & Demerouti, 2007). Xanthopoulou and colleagues (2007) hypothesised the aforementioned interactions between personal and job resources based on common ground identified between conservation of resources (COR; Hobfoll, 1989) and JD-R theories. COR theory proposes that individuals strive to retain, protect and build resources and are therefore threatened by the potential or actual loss of these resources (Hobfoll, 1989). Building on Hobfoll, Johnson, Ennis and Jackson's (2003) definition of personal resources, Houdmont and Leka (2010, p. 129) have offered an updated definition, "lower-order, cognitive-affective aspects of personality; developable systems of positive beliefs about one's self (e.g., self-esteem, self-efficacy, mastery) and the world (e.g., optimism, faith) which motivate and facilitate goal-attainment, even in the face of adversity or challenge". Deci, Connel and Ryan (1989) offer an alternative explanation as to why job resources may be motivating for individuals. Job resources satisfy basic human needs for control (job autonomy), belonging (social support) and competence (feedback) (Schaufeli & Bakker, 2004) and this safisfaction is intrinsically motivating. Evidence for the addition of personal resources to JD-R theory is presented within a cross-sectional study investigating the role of three personal resources (self-efficacy, organisational-based self-esteem and optimism as foundational aspects of personal adaptability) to the JD-R model in a sample of Dutch private sector employees (N = 1,439; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). The study results showed that all three personal resources mediated the relation between job resources and engagement (and did not interact with job demands or exhaustion). A more recent longitudinal study examining (reciprocal) relations between personal resources (work-related self-efficacy, positive affect) and work engagement over a 2-year period in a sample of entrepreneurs indicated support for the inclusion of personal resources (N = 206; Laguna, Razmus, Żaliński, 2017). The results showed reciprocal associations between personal resources and work engagement over time. Specifically, positive affect was found to predict

work-related self-efficacy (and was positively associated to work engagement), and in turn, self-efficacy predicted work engagement and positive affect (and work engagement predicted positive affect). The exact role(s) of personal resources within JD-R have yet to be determined. For example, personal resources have been examined as predictors of employee well-being by directly predicting burnout and engagement (Lorente et al., 2008), and as moderators in the work characteristics/well-being association by alleviating the negative effects of job demands and intensifying the positive effects of job resources (Van den Broeck et al., 2011).

Employee Health Outcomes

Despite the centrality of the health impairment process within JD-R, health is not considered directly as an outcome in the model. This omission is important considering the prevalence of negative psychological outcomes (e.g., stress, depressive symptoms) in the workplace in recent years (e.g., Armon, Melamed, Toker, & Shapira, 2014; Zheng et al., 2015) and evidence showing a range of negative physical health outcomes (e.g., high triglyceride levels) and some primary chronic illnesses (e.g., type 2 diabetes mellitus) are associated with burnout (He, Chen, Zhan, Wu, & Opler, 2014; Melamed, Shirom, Toker, & Shapira, 2006; Toker, Melamed, Berliner, Zeltser, & Shapira, 2012). Examples of health outcomes associated with burnout are reported within a correlational study investigating mood states (e.g., tension-anxiety, vigour-activity) and indicators of physical health (body mass index, high triglyceride, high density lipoprotein), and their relation to job stress and burnout in a sample of hospital employees (N = 400; He et al., 2014). The results showed job stress was associated with triglyceride levels (r = 0.175, P = 0.01), body mass index (r = 0.121, P < 0.05), and high density lipoprotein (r = -0.117, P < 0.05), as well as emotional exhaustion (r = 0.562, P < 0.01), depersonalisation (r = 0.474, P < 0.01) and reduced personal accomplishment (r = 0.287, P < 0.01; burnout dimensions). Other research has revealed links between burnout and chronic lifestyle illnesses. For example, Toker and colleagues (2012) longitudinally examined the association between coronary heart disease (CHD) incidence and burnout in sample of health employees (N = 8,838) over an average follow-up time of 3.4 years. The results revealed a significant positive association between baseline burnout levels and an increased risk of CHD incidence, adjusting for well documented risk

factors (HR = 1.41; 95% CI = 1.08–1.85) (Toker et al., 2012). In line with these findings, another longitudinal study tested the extent to which the incidence of type 2 diabetes was predicted by burnout in a sample of employed individuals who were healthy at baseline (N = 677; Melamed et al., 2006). The results revealed that burnout was related to a 1.84-fold increased risk of acquiring type 2 diabetes (95% CI = 1.19-2.85) 3.6 years later, controlling for demographic (e.g., age, gender) and health-related variables (e.g., body mass index, physical activity levels). Besides evidence on the concept of burnout, there appears to be limited attention devoted to employee health outcomes in relation to other constructs of the JD-R model (i.e., job demands, job resources, personal resources and work engagement) with few exceptions (e.g., Hakanen et al., 2008).

Employee Health Behaviours

Health behaviours can be thought of as modifiable factors that contribute to positive and/or negative physical (e.g., good cardiovascular health or increased blood pressure) mental (e.g., positive emotions or anxiety) and social (e.g., social engagement or lack of social support) outcomes. Past research has highlighted the negative health outcomes and increased risk of mortality associated with unhealthy (or risky) behaviours such as smoking and physical inactivity (e.g., Carter et al., 2015; Kodama et al., 2013). As an example, results from a recent longitudinal study examined which health-enhancing behaviours (e.g., strength exercise, non-smoking, avoidance of unhealthy snacks) most closely associated with the development of chronic illnesses (i.e., hypertension, obesity, type 2 diabetes, heart disease, hypercholesterolemia) as part of a ten-year workplace wellness program (N = 10,248). The findings suggested that the most important behaviours affecting future health are a low-fat diet, aerobic exercise, non-smoking and adequate sleep (Byrne et al., 2016). Dietary fat intake was found to be most strongly associated with chronic illness and health outcomes (dose-response effect), followed by aerobic exercise. Participants who exercised four days per week (20 to 30 minutes of aerobic exercise) were less likely to develop new-onset of diabetes (HR = 0.31, 95% CI = 0.20, 0.48), heart disease (HR = 0.46, 95% CI = 0.27, 0.80) and hypercholesterolemia (HR = 0.61, 95% CI = 0.50, 0.74). Evidence from studies on worksite health promotion programs suggests individual health behaviours and associated future physical and mental health outcomes are relevant to the workplace.

For example, engagement in behaviours that may lead to impaired health (e.g., being overweight, high blood pressure) has been associated with increased health care costs (Nyce, Grossmeier, Anderson, Terry, & Kelley, 2012), and decreased job satisfaction levels have been associated with negative organisational outcomes including burnout and reduced self-esteem levels (Faragher, Cass, & Cooper, 2015). Considering health is (at least partly) modifiable and the critical importance of health behaviours to health (e.g., Byrne et al., 2016; Nyce et al., 2012), employee health behaviours are important to consider in relation to JD-R constructs. However, health behaviours are not currently considered as part of the JD-R. Evidence indicates employee engagement in healthy behaviours (e.g., physical activity, fruit and vegetable consumption, adequate sleep) predicts both health and well-being (e.g., Alvarez & Ayas, 2004; Doi, Minowa, & Tango, 2003; Litwiller, Snyder, Taylor, & Steele, 2017; Liu et al., 2013, 2000; Sofi, Capalbo, Cessari, Abbate, & Gensimi, 2008) and work-related outcomes such as productivity, job performance and job satisfaction (e.g., Arvidson, Borjesson, Ahlborg, Lindegard, & Jonsdottir, 2013; Dean et al., 2010; Guertler et al., 2015; Katz, Pronk, & Lowry, 2014; LeCheminant, Merrill, & Masterson, 2015), however, evidence on employee health behaviours and JD-R model outcomes (and processes) appears to be limited.

The Present Research

The main aims of this research project were: (1) to scope the existing literature on what is currently known about the associations between JD-R constructs and employee health behaviours; (2) to identify employee typologies of job demands and resources and examine their differences on health behaviours and selected workplace constructs; and (3) to examine the temporal associations between employee health behaviours and JD-R model constructs. Through the current chapter (chapter I), I provide context on workplace well-being, and associations between employee health outcomes, health behaviours and constructs of the psychosocial work environment. In Chapter II, I outline a systematic scoping review study investigating the associations between multiple employee health behaviours and constructs from the JD-R model. In Chapter III, I use a person-centred approach to identify employee typologies and examine their differences on JD-R model constructs and health behaviours. In Chapter IV, I build on the findings presented in Chapter III and examine the temporal associations between

employee health behaviours and JD-R model constructs using a daily diary design. Chapter V presents a general summary, synthesis, discussion and conclusion of the research.

Chapter I Summary

Health behaviours may be thought of as modifiable risk factors that contribute to positive and/or negative health. Associations between health-impairing behaviours and negative health outcomes are well-established, as is the centrality of employee health in the context of work. Despite this, little is known about how health behaviours are associated with employee well-being, constructs of the psychosocial working environment and workplace constructs. In order to investigate these associations, the job demands-resources (JD-R) model was employed as a guiding theoretical framework in this research project. Since the model's conceptualisation, a considerable amount of research has shown support for the motivational and health impairment processes. Even though the health impairment process is key to the JD-R model, health behaviours are currently not considered within the model. The overarching aim of the present research was to address this gap in the literature through three empirical studies. First, a scoping review study was carried out in order to map out the literature on what is currently known about the associations between employee health behaviours and constructs of the JD-R model (chapter II). Second, JD-R profiles of employees were identified using cross-sectional survey data and differences on health behaviours and workplace constructs were examined (chapter III). Third, the temporal associations between health behaviours and JD-R model constructs were examined (chapter IV).

CHAPTER II: INVESTIGATING ASSOCIATIONS BETWEEN HEALTH BEHAVIOURS AND CONSTRUCTS FROM THE JOB DEMANDS-RESOURCES MODEL: A SCOPING REVIEW

Introduction

The workplace has been recognised globally as an important setting for protecting and promoting employee health and well-being (e.g., European Network of Workplace Health Promotion, 2005; Yancey, Pronk, & Cole, 2007). Besides providing access to a substantial portion of the adult population, employees spend a significant amount of time in the workplace (Hymel et al., 2011; Sorensen et al., 2011). In Australia, it has been estimated that full-time employees spend an average of seven hours per day at work (Australian Bureau of Statistics, 2010). There is convincing evidence showing that ill employee health and poor well-being is associated with organisational costs such as health care costs and decreased or lost productivity rendering these issues important concerns for organisations (Australian Public Service Commission, 2013; Peake et al., 2012). The purpose of the present chapter was to scope the literature on what is currently known between a number of health behaviours and key psychosocial working environment constructs.

In recent years, employers have focused on improving employee health and well-being through workplace health promotion strategies and interventions (e.g., smoking cessation; Jørgensen, Villadsen, Burr, Punnett, & Holtermann, 2016; Malik, Blake, & Suggs, 2014). Considering ill employee health is related to individual lifestyle choices (e.g., tobacco consumption) and the working environment, it is important to also examine job characteristics in the context of employee health and well-being (Bulotaitė et al., 2017). These include physical characteristics of the job (e.g., repetitive mechanical work and associated muscle and joint complaints; Spallek, Kuhn, Uibel, Van Mark, & Quarcoo, 2010), as well as psychosocial dimensions (e.g., high strain and associated fatigue; Lourenço, Carnide, Benavides, & Lucas, 2015). In examining employee health and well-being, it is important to employ a theoretical framework that encompasses key concepts from the occupational work environment.

The job demands-resources model (JD-R; Bakker & Demerouti, 2007; Demerouti & Bakker, 2011; Demerouti et al., 2001a, 2001b), a descendant of Karasek's (1979) job demand-control model (JDC), is one of the most commonly employed models of occupational well-being. It is a heuristic that is useful across a range of organisational contexts because it provides a framework in which all types of job characteristics can be classified as either job demands or job resources, irrespective of the job position or type of organisation. Job demands are defined as aspects of the job (social, psychological, physiological and/or organisational) that are effortful (psychologically and/or physically) and are associated with costs (psychological and/or physical; e.g., high work pressure; Bakker & Demerouti, 2007). Examples of job demands include work overload, time pressure and work insecurity. Conversely, job resources are defined as aspects of the job (social, psychological, physiological and/or organisational) that are conducive to attaining work goals, alleviating costs associated with job demands, and promoting growth and development (Bakker & Demerouti, 2007). Examples of job resources include social support from colleagues, job autonomy and supervisor feedback (Schaufeli, 2017). The JD-R was originally used to predict burnout, defined as "a syndrome of emotional exhaustion, depersonalisation, and reduced personal accomplishment that can occur among individuals who work with people in some capacity" (Maslach, Jackson, & Leiter, 1996, p. 4). Later, the model was expanded to increase understanding of predictors of work engagement (Schaufeli & Taris, 2014), which has been described as a cognitive-affective state in the work environment that is characterised by vigour, dedication, and absorption (Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002).

Broadly speaking, there is substantial support for the JD-R in the prediction of both health and organisational outcomes (Demerouti & Bakker, 2011). As far as health outcomes are concerned, the evidence suggests that the presence of burnout has negative consequences for physical health such as increased risk of future hospitalisation due to cardiovascular problems and an increased risk of regional musculoskeletal pain (Melamed, 2009; Melamed, Shirom, Toker, Berliner, & Shapira, 2006; Toppinen-Tanner et al., 2009). Similarly, burnout and other work-related behaviours such as increased work stress have been associated with mental ill-health such as depression and anxiety

(Glise, Hadzibajramovic, Jonsdottir, & Ahlborg, 2010; Schulz, Chen, & Edington, 2009). Past research considering the role of job demands and resources on burnout and depression has shown that burnout mediates the effect of job demands on future incidence of depression (Hakanen, Schaufeli, & Ahola, 2008). Though the exact nature of the sequence of the burnout-depression relation remains unclear (Sharon & Michal, 2012), the evidence suggests reciprocal relations between these two constructs (Ahola & Hakanen, 2007). Furthermore, there is ample evidence linking burnout with negative work-related outcomes such as intention to leave one's job, low job satisfaction and low organisational commitment (Enginyurt et al., 2016; Ha, King, & Naeger, 2011; Jourdain & Chênevert, 2010; Khamisa, Oldenburg, Peltzer, & Ilic, 2015). In contrast to burnout, evidence on work engagement and health outcomes is less clear on the strength and direction of associations. Some evidence indicates work engagement is moderately associated with health-enhancing behaviours such as regular physical exercise, dietary intake of fish and sufficient sleep (Nishi et al., 2017) and positive organisational outcomes (e.g., reduced instances of absenteeism; De Beer, 2014).

The mechanisms or processes by which job demands and resources lead to burnout and work engagement are a central feature of the JD-R model (Bakker, Demerouti, & Schaufeli, 2003; Demerouti, Bakker, De Jonge, Janssen, & Schaufeli, 2001b; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001a). Two underlying psychological processes are assumed to lead to either job strain (health impairment process) or motivation (motivational process). Excessive or chronic job demands (or poor job design) lead to burnout and consequently poor health (via the health impairment process), and job resources being motivational in nature, lead to high work engagement and high work performance (via the motivational process). Moreover, JD-R theory postulates that the interaction between job demands and job resources is also important for the development of job strain and motivation. Specifically, high levels of job resources are proposed to attenuate the effect of increased job demands on job strain and burnout, such that individuals who perceive high levels of job demands yet also perceive many resources are less likely to develop burnout compared to individuals with perceptions of few resources (Bakker et al., 2003c). In addition, job resources have been shown to influence motivation and work engagement particularly when job demands are high (known as the

"coping hypothesis"; Bakker et al., 2007; Bakker, Van Veldhoven, & Xanthopoulou, 2010). In addition, job resources have been shown to buffer the effects of high job demands on strain and health (known as the 'coping hypothesis'; Bakker et al., 2007; Bakker, Van Veldhoven, & Xanthopoulou, 2010). Bakker and colleagues (2007) tested this hypothesis in a sample of Finnish employees (N = 805) and found that job resources are most facilitative for work engagement when job demands are high. As another example, and in regards to health, a large (N = 14,337) prospective (3.5 years) study among middle aged male employees without cardiovascular disease showed that lack of social support at work (a job resource) boosted the effect of physical job demands and significantly increased the risk for incidence of coronary heart disease (CHD; fully adjusted HR 2.50: 95% CI 1.3-5.50), whereas the presence of social support reduced the risk of CHD incidence substantially (fully adjusted HR 0.40; 95% CI 0.09-1.70) (Clays et al., 2016).

More recently, the JD-R model was extended to take into consideration personal resources alongside characteristics of the work environment (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007a). Personal resources are defined as the psychological characteristics that are linked to resiliency and describe one's ability to control and impact one's environment successfully (Schaufeli & Taris, 2014). Personal resources have been integrated into the JD-R model in a number of ways. First, resources are said to influence well-being directly. For instance, emotional and mental capabilities in the beginning of the academic year were found to predict burnout and engagement levels at the end of the year in a sample of Spanish secondary school teachers (N = 274; Lorente, Salanova, Martinez, & Schaufeli, 2008). Second, personal resources (e.g., self-efficacy) are proposed as moderators in the association between job characteristics and work-related well-being, specifically by mitigating the negative effects of job demands and enhancing the positive effects of job resources (Mayerl, Stolz, Großschädl, Rásky, & Freidl, 2017). This moderation effect is demonstrated by a study among Dutch employees (N = 4,009) that showed personal resources (operationalised as intrinsic work motivation) attenuated the negative effects of learning on exhaustion and enhanced the positive effects of autonomy on work engagement (Van den Broeck, Van Ruysseveldt, Smulders, & De Witte, 2011). This effect has also been observed in the work stress – psychological strain relation across different

occupational samples (e.g., McDougall & Drummond, 2010; Schmidt & Diestel, 2013). Third, resources can act as mediators of the relation between job characteristics and work-related well-being. This effect stems from the idea that resources accumulate and in the JD-R context, resourced employees who are confident and optimistic about their work will exhibit high work engagement. Several studies have supported this notion by showing that personal resources (such as self-efficacy, optimism) mediate the relation between job resources and work engagement (e.g., Vink, Ouweneel, & Le Blanc, 2011; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009). Fourth, resources may determine how job characteristics are perceived (Judge, Bono, & Locke, 2000). As an example, Lorente, Salanova, Martinez and Vera's (2014) cross-sectional study showed that personal resources were positive predictors of perceptions of job resources and in turn, led to work engagement and performance in a sample of construction workers (N = 228). Fifth, resources may function as a "third variable" explaining the relation between perceptions of job characteristics and work-related well-being (Bakker et al., 2010). Mayerl and colleagues (2017) cross-sectionally investigated the role of personal resources in the job demands – health relation across a diverse Austrian employee sample (N = 9,434). The study results showed a strong negative association between job demands and health outcomes (i.e., as job demands increased, negative health symptoms and mental strain also increased), and personal resources were found to predict health directly. The proposed "third variable" hypothesis was in-part confirmed as a very small variation in health was explained by job demands and personal resources.

The Role of Health Behaviours

Despite the relevance of JD-R to a range of health outcomes, the role of health behaviours in relation to the JD-R is currently unknown. This exclusion is an important gap in the literature as health behaviours are key drivers of health and well-being (Brown, Buboltz, & Soper, 2002; Cappuccio et al., 2010; Sofi et al., 2008; Wicker & Frick, 2015). Health behaviours refer to activities that can be seen (e.g., lifting weights) or heard (e.g., discussing dietary requirements with a dietician) by an observer that may positively or negatively influence health (World Health Organisation, 1998, p. 8). Physical activity, for example, refers to any bodily movement that results in energy expenditure,

and as such, includes sub-components such as structured exercise (Caspersen, Powell, & Christensen, 1985). Here, it is important to recognise that some health behaviours are health-enhancing (e.g., physical activity, consumption of adequate fruits and vegetables, and sufficient and good quality sleep), whereas others are associated with health risks (or are health-impairing such as smoking, alcohol consumption, and sedentary behaviour). Sleep has been defined as "a recurring, reversible neuro-behavioural state of relative perceptual disengagement from and unresponsiveness to the environment typically accompanied by postural recumbence, behavioural quiescence, and closed eyes in humans" (Carskadon & Dement, 2005, p. 214). Smoking refers to habitual consumption of tobacco leafs and its products most commonly via inhalation (e.g., cigarettes, pipes; Mohamed, Al-Ibrahim, & Gross, 1990). Sedentary behaviour occurs as a result of a sitting, lying or reclining posture resulting in energy expenditure below 1.5 METs (Tremblay et al., 2017). For the purpose of this review, a range of health behaviours (both health-enhancing and those associated with health risks) will be considered.

Four widely studied health behaviours in occupational health psychology are smoking, excessive alcohol consumption, diet, and physical activity (Conner & Norman, 2017). An emerging health risk is increased sedentary behaviour that is mostly prevalent in western countries (e.g., north-western European countries; Bennie et al., 2013). Another emerging public health concern is sleep problems (e.g., decreased sleep quality and duration) that has been observed in low-income (e.g., Africa, Asia; Stranges et al., 2012) as well as high-income settings (e.g., USA, Germany; Leger, Poursain, Neubauer, & Uchiyama, 2008). Health behaviours share similarities (e.g., "easy immediate pay-offs" versus "effortful long-term pay-offs"; McEachan, Lawton, & Conner, 2010), and have both common (e.g., self-efficacy, motivation) as well as unique (e.g., knowledge, habit) determinants (Conner & Norman, 2017). Importantly, individuals engage in a range of health behaviours simultaneously (and not in isolation). Considering their importance for employee health and well-being, it is important to examine concurrent health behaviours.

Health behaviours may relate to JD-R constructs in a number of ways. First, it is possible that health behaviours may work as mechanisms in the association between burnout and health and

organisational outcomes. Cross-sectional studies have shown that burnout is associated positively with infrequent exercise, alcohol consumption and frequency of fast-food consumption (e.g., Ahola et al., 2012; Alexandrova-Kamarova et al., 2016; Moustou, Panagopoulou, Montgomery, & Benos, 2010). In turn, such health behaviours have been shown to predict health and work-related outcomes, such as absenteeism (e.g., Katz et al., 2014; LeCheminant et al., 2015) and presenteeism (e.g., Guertler et al., 2015; Walker et al., 2017). Second, it is possible that health behaviours moderate the perceptions of the impact of excessive job demands on burnout or exhaustion. For example, some health behaviours may function as coping mechanisms protecting individuals from burnout or exhaustion as a result of job demands (Payne, Jones, & Harris, 2012). Third, engagement in positive health behaviours may work alongside job resources to predict work engagement. For example, a meta-analysis reported a moderate sized effect of physical activity on increases in energy (akin to vigour) and reductions in fatigue (Puetz, O'Connor, & Dishman, 2006). Reed and colleagues have also demonstrated increases in high activation positive affect (e.g., energy or vigour) from low-to-moderate intensity physical activity (Reed & Buck, 2009; Reed & Ones, 2006). Evidence from the workplace context has shown that physically inactive employees (N = 75) participating in lunchtime walks increased levels of enthusiasm (akin to vigour which is a key component of engagement) at work from the morning to the afternoon after the walk (Thøgersen-Ntoumani et al., 2015).

A fourth possibility is that health behaviours are directly predicted by job demands or resources. For instance, a review of prospective studies (N = 55) conducted by Stults-Kolehmainen and Sinha (2014) showed that the presence of stress resulted in low levels of physical activity. In the context of job demands specifically, a large cross-sectional study by Tsutsumi and colleagues (N = 6,759; 2003) showed that individuals who experienced high job demands engaged in less leisure-time physical activity. Evidence relating to other health behaviours shows that excessive job demands positively predict alcohol consumption and smoking (Azagba & Sharaf, 2011; Nielsen, Finne, Christensen, & Knardahl, 2015), unhealthy eating behaviours (Liu et al., 2017), and is negatively associated with sleep quantity and quality (Barber & Santuzzi, 2015; Berset et al., 2011; Nixon et al., 2011; Stenfors et al., 2013). As an exception to the evidence presented for the link between work

environment characteristics and health-impairing health behaviours, McCarthy, Perry, Harrington, and Greiner (2015) cross-sectionally investigated associations between job demands and resources and protective health behaviours (physical activity, fruit and vegetable consumption, moderate alcohol intake, and non-smoking) in a sample of Irish health care workers (N = 1,025). Their findings showed that protective health behaviours were not consistent in their associations with job demands and resources. Specifically, in older workers (50 to 59 years old), positive associations between demands and protective health behaviours (i.e., physical activity, and fruit and vegetable consumption) were identified, while high demands and low job control were not associated with protective health behaviours.

Aims and Objectives

Before the exact role of health behaviours can be elucidated, it is critical to scope the literature on research that has been conducted in this area so far. Therefore, the major aim of this scoping study is to examine what is currently known about the associations between employee health behaviours (physical activity, sedentary behaviour, fruit and vegetable intake, sleep, alcohol consumption, and tobacco use) and specific constructs from the JD-R model (job demands, job resources, work engagement/disengagement, and burnout; Demerouti et al., 2001a, 2001b). A scoping review will enable a better understanding of the strengths and limitations of the evidence to date, and provide directions for future research. It has been noted that in recent years, scoping reviews are increasingly being employed to synthesise research and are particularly useful when a topic has not been extensively investigated (Pham et al., 2014).

The results of this review will be important for theoretical reasons and, more generally, knowledge advancement. First, in terms of the importance of the results of this scoping review for research, they are expected to help better understand the volume of available studies by mapping the research material available over the past 17 years in terms of these associations; summarise and disseminate the findings; and draw conclusions about the state of the research field (e.g., what health behaviours and/or JD-R model constructs should be further examined), or identify the potential relevance and value of undertaking a full systematic review. The start date of searches was set to 2001

to match the year of the original JD-R model publication (Demerouti et al., 2001). This was done in order to avoid omitting any potentially relevant articles. A scoping review is suitable for achieving this objective as it has been suggested that a synthesis of current research where a gap in knowledge is identified provides a sound foundation for developing additional research questions (Peterson, Pearce, Ferguson, & Langford, 2017). Second, the results of this review may contribute to the expansion of current theory to include the role of health behaviours within the JD-R and possible mechanisms underpinning health outcomes in the context of this model. Third, this review can shed light on how employee engagement in positive and negative health behaviours is conceptualised in the context of the JD-R.

Method

This review employed the stepwise methodological framework described by Arksey and O'Malley (2005) for conducting a scoping review, namely, a) identifying the research question, b) identifying relevant studies, c) study selection, d) charting the data, and e) collating, summarising, and reporting the results. In order to determine what is known between employee health behaviours and JD-R model constructs (i.e., answer the overarching research question; RQ4), three additional research questions were formed (RQ1, RQ2 and RQ3).

Research Questions

RQ1: Which health behaviours and JD-R model constructs are measured in primary studies and in what context?

RQ2: What do the results of the primary studies included in the review show?

RQ3: What does an assessment of methodological quality of the included studies show?

RQ4: What is known from the existing literature about the associations between key health behaviours (i.e., physical activity, sedentary behaviour, fruit and vegetable intake, sleep, alcohol consumption, and tobacco consumption) and selected constructs from the JD-R model (i.e., job demands, job resources, work engagement, burnout) over the past 17 years (2001-2017)?

Identifying Relevant Studies

Relevant studies were identified in three steps. First, searches were conducted across six databases (CINAHL, PubMed, PsychINFO, PsychArticles, Scopus and Web of Science) to identify peer-reviewed articles and grey literature (unpublished research manuscripts and/or published in non-commercial form, e.g., theses and dissertations, conference proceedings, etc.) that had cited the original JD-R model (i.e., searched for 'job demands resources model' throughout all databases; search results for each database shown in Appendix A). Second, all search results were downloaded and imported into a reference management software program (EndNote, Version X8). The search revealed a total of 8,321 results of which 1,567 were duplicates and were removed. Third, the remaining 6,754 articles were screened by title and abstract. Where I was unable to judge based on the abstract whether a study was relevant to the main research question (e.g., lack of clarity on whether health behaviours were assessed), it was selected in the list of relevant articles and a full-text copy was obtained. Only 65 were identified as relevant to the main research question (i.e., RQ4) and full-text screened (Appendix B). Articles published prior to 2001 (i.e., prior to the publication of the original JD-R model) and articles not available in English were excluded. The following information was recorded for these studies (N = 65): (i) author(s), publication year, study location, (ii) study aims, (iv) study design, (v) measures, and (vi) key results. The total number of results and exclusion of articles at each stage of the process is shown in Figure 2.1.

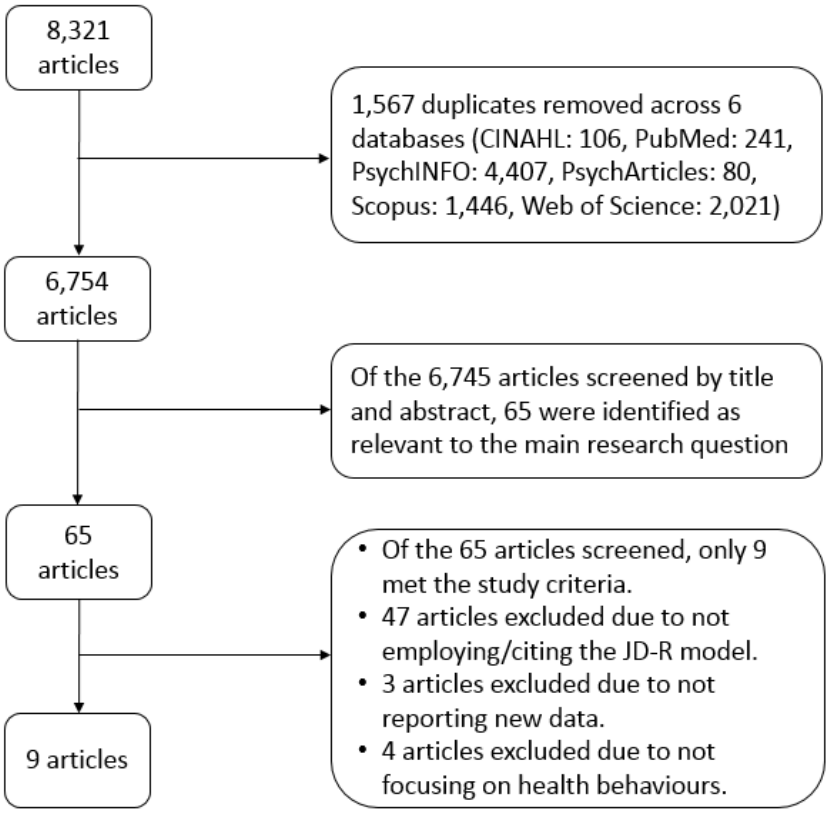

Figure 2.1. Total number of results and exclusion of articles.

Similarly to systematic review methodology, inclusion and exclusion criteria were developed in order to identify and eliminate studies that were (ir)relevant to the research questions. Contrary to systematic review methodology, however, some of the inclusion criteria were finalised after having aggregated all of the data, as familiarity with the available literature was considered necessary in order to avoid omitting potentially important primary articles. Development of inclusion criteria post hoc has been suggested previously (e.g., Arksey & O'Malley, 2005) and this approach is consistent with the purpose and objectives of a scoping review, that is, to answer a broader question and explore related literature in less depth (compared to a systematic review which is focused on answering a well-defined question in greater depth; Peterson et al., 2017). It is therefore anticipated that researchers will redefine search terms, or may not wish to strictly limit the process of identifying relevant studies or selecting studies at the outset (Arksey & O'Malley, 2005). This point can be exemplified by the exclusion of two articles (Hagger, Wood, Stiff, & Chatzisarantis, 2009; Häusser & Mojzisch, 2017) and one book chapter (Shirom, Armon, Berliner, Shapira, & Melamed, 2009) from

the present review. After being identified as relevant to the RQ (and prior to finalising the inclusion criteria), it was decided that the review would employ studies that presented empirical data (i.e., that were not philosophical or conceptual in nature).

The final inclusion criteria employed required that articles: 1) were written in English, 2) focused explicitly on one or more health behaviours (i.e., physical activity, sedentary behaviour, fruit and vegetable intake, sleep, alcohol consumption, and tobacco consumption), 3) cited and employed constructs included in the original JD-R model (even if these were operationalised as specific aspects of the job context in the included study), 4) reported new empirical data (articles were not conceptual or philosophical in nature), and 5) were published between 2001 and 2017.

Of the 65 articles identified as relevant, 47 articles were excluded due to not employing or citing the JD-R model; three were excluded due to not reporting new data (i.e., were theoretical in nature); two were not available in English; and 4 articles were excluded due to not explicitly focusing on health behaviours. Thus, only nine (N = 9) articles were found to meet the study criteria and were included in the review (see Table 1). Key information (i.e., authors, year of publication, study location, study population and sample, aims of the study, methodology, citing the JD-R model, measures, and important results) for all articles was extracted and charted after obtaining and reading full copies of each study (Appendix C). Specifically, the descriptive-analytical method described by Pawson (2002) was adopted for data extraction. Due to the range of different study designs under review, a completely uniform approach for this analytical framework could not be planned ahead of time for extracting and evaluating information from all articles, so it was developed as the articles were being screened and inclusion criteria were applied (similar to Badger, Nursten, Williams, & Woodward, 2000).

Table 1
Articles Meeting the Study Criteria and Included in Scoping Review (N = 9).

Author(s)/Publication year	Study location	Study design	Sample Size
Bergin & Jimmieson (2014)	Australia	Cross-sectional	384
Clinton et al. (2017)	UK	Daily diary	193
Costa (2014)	USA	Cross-sectional	349
De Beer et al. (2014)	South Africa	Cross-sectional	734
Fodor et al. (2014)	Germany	Longitudinal	174
Frone (2016)	USA	Cross-sectional	2,975
Liu et al. (2017)	China	Daily diary	235
Mäkelä et al. (2014)	Finland	Longitudinal	2,562
Mayerl et al. (2017)	Austria	Cross-sectional	9,434

Analysis

Three stages of analysis were employed in this review in order to answer the research questions. First, descriptive mapping provided detailed methodological information and context on each of the studies (RQ1). This stage of analysis facilitated an understanding of which health behaviours and JD-R model constructs were measured in the included studies and presented important results (RQ2). Second, a quality assessment examined the methodology employed in each of the studies (methodological relevance of research design and relevance of evidence; RQ3). The quality assessment was informed by the Evidence in Policy and Practice (EPPI) Centre's Weight of Evidence framework (Gough, 2007). Specifically, two dimensions from the framework informed the assessment; one dimension concerned each study's methodological relevance, and the other dimension concerned the relevance of each study's evidence to the main RQ. Third, a narrative synthesis approach was employed to summarise the study findings in order to answer the overarching RQ (i.e., what is known from the literature on the associations between selected employee health behaviours and JD-R model constructs; RQ4).

Results

Descriptive Mapping

RQ1: Measurement of health behaviours, JD-R model constructs and context

This scoping review includes a total of 17,534 participants ranging from 193 to 9,434 for each study published between 2001 and 2017. Participants from eight countries were included in the primary studies (Australia, Austria, Britain, China, Finland, Germany, South Africa and the USA) reporting a total of 8,115 women and 9,419 men. The age ranged from 18 to 87 years (estimated for five of nine studies as the age range could not be calculated for four studies due to grouping of participants' ages; Clinton, Conway, & Sturges, 2017; De Beer, Pienaar, & Rothmann Jr., 2014; Fodor, Antoni, & Wiedemann, 2014; Mäkelä, Bergbom, Tanskanen, & Kinnunen, 2014). Besides reporting the country where the research was conducted, no ethnicity information for participants was reported in any of the primary studies (only one study conducted in South Africa reported that the most prevalent languages spoken at home were English and Afrikaans but did not indicate the ethnicity of the participants; De Beer et al. 2014). With regards to study design, five studies employed a cross-sectional survey design (Bergin & Jimmieson, 2014; Costa, 2014; De Beer et al., 2014; Frone, 2016; Mayerl, Stolz, Großschädl, Rásky, & Freidl, 2017), two employed a daily diary design (Clinton et al., 2017; Liu et al., 2017) and two employed a longitudinal design (Fodor et al., 2014; Mäkelä et al., 2014).

All primary studies included in the review examined at least one health behaviour, employed at least one JD-R model construct (even if these were operationalised as specific aspects of the job context in the included study), and cited the JD-R model (regardless of their relevance to the main research question). In terms of health behaviours measured, one study examined fruit and vegetable consumption (Fodor et al., 2014), two studies examined tobacco consumption (De Beer et al., 2014; Mayerl et al., 2017), three studies examined alcohol consumption (Bergin & Jimmieson, 2014; Frone, 2016; Mayerl et al., 2017) and three studies examined exercise, a common indicator or subcomponent of physical activity (Costa, 2014; De Beer et al., 2014; Mayerl et al., 2017). Four studies investigated sleep behaviour – two studies measured sleep quality (Clinton et al., 2017; Liu et al., 2017) and two studies measured sleep difficulties (De Beer et al., 2014; Mäkelä et al., 2014). Bergin and Jimmieson (2014) measured alcohol misuse (operationalised as a strain variable in their study). All included studies employed self-report measures of health behaviours. In terms of JD-R model constructs

measured, seven studies examined job demands (Bergin & Jimmieson, 2014; Costa, 2014; Fodor et al., 2014; Frone, 2016; Liu et al., 2017; Mäkelä et al., 2014; Mayerl et al., 2017), four studies examined job resources (Bergin & Jimmieson, 2014; Costa, 2014; Fodor et al., 2014; Mayerl et al., 2017), one study measured burnout (De Beer et al., 2014) and one study measured (aspects of) work engagement (Clinton et al., 2017). Of the JD-R model constructs measured, Costa (2014) operationalised job resources as job control, and procedural and distributive justice in the workplace; Mäkelä and colleagues (2014) operationalised job demands as international business travel, Liu and colleagues (2017) as customer mistreatment, and Bergin and Jimmieson (2014) as high time-billing targets. Costa (2014) operationalised job stressors as high job demands and low job resources, and Fodor and colleagues (2014) operationalised job risk factors as the result of the job demands – job resources interaction, and Clinton and colleagues (2017) operationalised calling and calling intensity as absorption, a dimension of work engagement.

RQ2: Results of the primary studies

Results of primary studies included in the review are presented below vis-à-vis their relevance to the main RQ upon initial observation. The first study conducted by De Beer and colleagues (2014) examined the relation between sleep difficulties and employee reported burnout whilst controlling for a number of demographic (age, gender) and health-related variables (exercise, smoking and depression treatment) using a cross-sectional study design in a random sample of South African employees (N = 734). Sleep difficulty was found to be positively related to burnout ($\beta = .452$, $p < 0.01$). The second study developed and cross-sectionally tested a moderated-mediation model of work stress and alcohol use based on two theoretical models (self-medication and stress-vulnerability models; Conger, 1956; Cooper, Frone, Russell, & Mudar, 1995) in a sample of USA government employees (N = 2,975; Frone, 2016). The results supported the assumption that employees may use alcohol to self-medicate (i.e., relieve themselves) from work fatigue ($b = .70$, $p < .001$) and negative affect ($b = .23$, $p < .001$) as a result of exposure to work stressors. The third study by Bergin and Jimmieson (2014) cross-sectionally investigated the types of job demands (e.g., time pressure, emotional demands, emphasis on profits), and job resources (e.g., job control, pay satisfaction, praise

from supervisor) experienced by Australian lawyers (N = 384) and the frequency of a number of psychological outcomes (e.g., depression, anxiety). With regards to health behaviours, alcohol misuse was considered a strain variable in the study (as opposed to an outcome). The results showed that alcohol misuse is prevalent in a sample of Australian lawyers (35%) and that lawyers with high job demands (operationalised as high time-billing targets) did not report higher levels of alcohol consumption when compared to lawyers with moderate or low job demands (low-to-moderate or no time-billing targets).

Fourth, Liu and colleagues (2017) conducted two daily diary studies and investigated the relation between work stressors (operationalised as job demands in Study 1 and as customer mistreatment – an occupation specific stressor – in Study 2), sleep quality, negative mood and eating behaviours (operationalised as healthy and non-healthy food consumption in Study 1, and as overeating behaviour in Study 2) in a sample of Chinese private sector employees (N = 235). The results of Study 1 suggest that employee experiences of job demands are likely to be associated with daily eating behaviours (i.e., food choices). Specifically, when employees experienced high job demands in the morning they were more likely to make unhealthy food choices and less likely to make healthy food choices (γ = -.30, p < .01), however, this effect was attenuated for employees who reported good sleep quality (γ = .48, SE = .15, p < .01) the previous night compared to employees who reported poor sleep quality (γ = .57, SE = .13, p = .01). The results of Study 2 confirmed an association between daily customer mistreatment and evening overeating behaviour (γ = .33, p < .01) via afternoon negative mood (γ = .32, p < .01). Moreover, sleep quality was found to be associated with next-day vigour (γ = .20, p < .01) which in turn, buffered (i.e., moderated) the customer mistreatment – afternoon negative mood relation (γ = -.17, p < .01). The fifth study by Mayerl and colleagues (2017) employed a cross-sectional research design to explore the buffering effects of personal resources (a construct including physical, mental and social resources measuring the biological, mental and social aspects, respectively) in the relation between job demands and a number of mental (e.g., exhaustion, irritation) and somatic health outcomes (e.g., headaches, hypertension) and health behaviours (leisure-time exercise frequency, tobacco and alcohol consumption). The study

was carried out in a sample of Austrian employees (N = 9,434). The study results revealed positive associations between psychosocial job demands and health symptoms ($p < 0.001$; β = 0.23, 99% CI = 0.21-0.26) as well as mental strain ($p < 0.001$; β = 0.39, 0.37-0.42) suggesting employees exposed to high levels of job demands are at greater risk for somatic and mental health issues. Moreover, a significant relation was found between health symptoms and (physical) personal resources (operationalised as physical fitness). Employees with high levels of physical fitness reported fewer symptoms of poor health when compared to their less fit counterparts, while revealing the beneficial function of physical fitness (i.e., alleviating the negative effects) on psychosocial job demands. The important role of physical fitness in the stress – physical health relation has been highlighted by past research and on this basis, the authors argue that fitter individuals may be better able to cope with job demands via decreased physiological activation which could otherwise lead to physical health damage in the long-term (e.g., Brown, 1991; Ensel & Lin, 2004; McEwen, 1998). Taken together, the results of this study suggest biopsychosocial personal resources may be beneficial to protect physical and mental health.

The sixth study by Mäkelä and colleagues (2014) examined the role of work-family conflict (WFC) as a mediator in the international business travel – health issues relation. Employing a longitudinal study design in a sample of USA internationally mobile workers (N = 2,562), Mäkelä and colleagues operationalised international business travel as a job demand, and sleep problems as health issues. Though the study results showed no significant relation between international business travel and sleep problems, it confirmed that WFC mediated the increased international business travel – sleep problems relation over time (p = 0.040; unstandardized estimate for indirect effect = 0.001, 95% CI = 0.000-0.001). The seventh study conducted by Costa (2014) explored the impact of job stressors (operationalised as the presence of increased job demands and decreased job resources) on job satisfaction (subjective well-being) and BMI (measure of objective health), and the effect of organisational justice and exercise as potential moderators and mediators in those relations, respectively. The sample consisted of a predominantly male sample of construction workers (N = 349) from the USA. The results showed that distributive (ΔR^2 = .20, β = .45, $p < .001$) and procedural

justice ($\Delta R^2 = .13$, $\beta = .37$, $p < .001$) had significant effects on job satisfaction (i.e., higher perceptions of justice were related to higher levels of job satisfaction), and indicated a significant interaction between job demands and exercise on BMI. For participants who engaged in limited exercise, job demands positively predicted BMI, while for individuals who engaged in greater levels of exercise, job demands only explained 2% of the variance in BMI. The eighth study by Clinton and colleagues (2017) employed a daily diary design to develop and test a multiple mediation model accounting for the positive and negative effects of intense work-related callings (during off-work time, i.e., evenings) on work-related morning vigour (i.e., work engagement), recovery from work experiences (i.e., psychological detachment from work) and sleep quality in a sample of church ministers ($N = 193$). The results showed that intense callings (i.e., by working additional hours) prevent individuals to disengage both physically ($b = .847$, $p = .004$) and psychologically from work ($b = -.258$, $p < .014$) when compared to individuals with less intense callings. Not disengaging from work in the evening time led to reduced sleep quality and was found to contribute negatively to morning vigour (i.e., reduced levels; $b = .174$, $p < .001$).

The ninth and final study by Fodor and colleagues (2014) employed a 4-week longitudinal design with 668 participants recruited from a range of different work sectors in Germany. The authors drew from the JD-R framework in order to conceptualise job stress risk factors (i.e., the interaction between job demands and job resources as per JD-R theory) and the Health Action Process Approach (HAPA; Schwarzer, 2008), which emphasises the roles of action (when, where and how plans) and coping planning (plans to overcome obstacles) in the behaviour change process. The study examined how job risk factors (the result of an interaction between job demands and resources) moderated 1) the association between intention to consume fruits and vegetables and its associated (action and coping) planning, and 2) the association between (action and coping) planning and fruit and vegetable consumption. The results revealed that job risk factors moderated the associations between intention and both types of planning. Specifically, participants intending to eat fruits and vegetables who experienced stressful conditions (i.e., where job demands outweighed job resources) engaged in greater amounts of action and coping planning ($\beta = 0.42$, $p < .001$). When employees with high

intentions to consume fruit and vegetables to the recommended level perceived themselves to have sufficient job resources, they refrained from forming action or coping plans. This suggests that employees who are experiencing high demands at their work may enhance their use of self-regulatory processes as a means of compensating for a lack of relative support.

Quality Assessment

RQ3: Methodological quality of primary studies

The assessment of quality and relevance of primary studies was conducted in two steps. First, because relevance of articles was an essential part of evidence synthesis, a preliminary assessment was conducted via the development of initial (i.e., inclusion of articles published in English, published between 2001 and 2017) and emerging inclusion criteria (e.g., inclusion of articles that report new data) for all articles (N = 65; Higgins & Green, 2006; Pawson, 2002). Second, review question-specific judgments were made for articles that met the study criteria (N = 9) based on EPPI's Weight of Evidence framework (Gough, 2007). The quality assessment focus was on review question-specific judgments (versus a generic form of appraisal) so as to enable the consideration of the extent to which studies meeting the criteria were fit to address the main RQ (regardless of how well the studies were executed; Gough, 2007). These judgments were made on the basis of two dimensions: (a) whether the study's methodology is appropriate for answering the main RQ (i.e., methodological relevance of research design; Weight of Evidence A), and (b) evidence relevance (i.e., a review-specific judgment about the relevance of evidence on RQ; Weight of Evidence B). Studies that met both Weight of Evidence A (WoE A; methodological relevance) and Weight of Evidence B (WoE B; topic relevance) were considered to be of high relevance to the RQ. Studies that met either WoE A or WoE B (or neither) were considered to be of low relevance. An overall assessment of the quality and relevance of each study is represented by Weight of Evidence C (WoE C; Appendix D). Two of nine studies were judged to be of high relevance to the main RQ (De Beer et al., 2014; Frone, 2016). Furthermore, results of two (of seven) studies that were judged to be of low relevance contributed to understanding the context of the main RQ (i.e., associations between health behaviours not included in this review and JD-R model constructs; Bergin & Jimmieson, 2014; Liu et al., 2017).

Narrative Synthesis

RQ4: Associations between health behaviours and JD-R model constructs

In scoping the literature to understand what is known about the relation between employee health behaviours and JD-R model constructs over the past 17 years (2001-2017), only two studies were identified as highly relevant based on the assessment of quality and relevance of primary studies. Studies that were considered to be of low overall relevance (WoE C) but were judged to be high in at least one of two dimensions (WoA or WoE B) are also discussed in this section of the chapter as their findings contributed to the context and understanding of the RQ. The first study judged to be of high relevance was conducted by De Beer and colleagues' (2014) who demonstrated a link between employee reported sleep difficulties and burnout. The study results are consistent with relevant literature on the associations between these variables (e.g., Barber et al., 2013; Peterson et al., 2008). Furthermore, from all the control variables employed in this study, only age and treatment for depression were found to contribute (i.e., to have a positive relational path) to reported sleep difficulties (and not exercise or tobacco consumption – two health behaviours also measured as control variables in De Beer and colleagues' study).

The second study identified as highly relevant was conducted by Frone (2016) who showed that employees who hold strong fatigue-reduction alcohol expectancies (i.e., beliefs motivating individuals to use or not to use alcohol based on the anticipated effects of alcohol on behaviour; Leigh, 1989) may use alcohol heavily to self-medicate from work fatigue as a result of exposure to work stressors. Although Frone (2016) did not consider alcohol use directly in relation to JD-R model constructs, the study considered exposure to work stressors (such as workload and work pace) as the main cause of employee fatigue. These stressors were operationalised as job demands for the purpose of this review. This is based on Frone's (2016) conceptualisation and measurement of work stressors. Work stressors scale items were found to correspond to Karasek and colleagues' (1998) psychological job demands subscale items from the Job Content Questionnaire (JCQ), also used in the measurement of job demands and resources in the original JD-R model publication (Demerouti et al., 2001b). Namely, these items were: emotional work demands (psychological job demands), workload

(excessive work), work pace (working fast) and role conflict (conflicting demands; JCQ corresponding items shown in parentheses). Notwithstanding, work fatigue, examined by Frone (2016), has been used interchangeably with the concept of exhaustion (Neckel, Schaffner, & Wagner, 2017) and has shown strong associations with exhaustion in a previous cross-sectional study (r = .81, p < .005; Basinska, Wiciak, & Dåderman, 2014). In turn, exhaustion is considered to be the principal dimension of burnout (Maslach, Schaufeli, & Leiter, 2001) signifying the relatedness of the concepts of fatigue and burnout. In conclusion, Frone's (2016) study results suggest that increased job demands are related to heavy alcohol consumption via work fatigue for employees who hold fatigue-reduction alcohol expectancies.

Two of the remaining seven studies were judged to be of low overall relevance (WoE C) however, they were judged to be high in one of two dimensions (WoE A or WoE B) and reported findings that contribute to the understanding of the associations between employee health behaviours and JD-R model constructs. With regard to the first study judged to be of low overall relevance, Bergin and Jimmieson (2014) assessed job demands and resources and one health behaviour (alcohol misuse) but their analysis did not examine their associations. Instead, the study aims were to examine the prevalence of job demands and resources, and a range of psychological outcomes in a sample of Australian lawyers (low topic relevance in spite study meeting review criteria). While Bergin and Jimmieson's study was found to be of high methodological relevance (e.g., study design, measurement of JD-R model constructs and one health behaviour), it was found to be of low evidence relevance (no examination of the associations between health behaviours and JD-R model constructs). However, the results showed that even though alcohol misuse was prevalent in this sample (35%) no differences were identified on alcohol misuse between groups of lawyers that experienced/perceived low, moderate or high job demands (operationalised as time low, moderate and high billing targets, respectively). With regards to the second study by Liu and colleagues (2017), though the measurement of eating behaviours (i.e., 'healthy' and unhealthy' eating) was not consistent with the conceptualisation of the relevant health behaviours (i.e., fruit and vegetable consumption) explored in this scoping review, the study results indicate associations between employee eating behaviours and

job demands (operationalised as customer mistreatment). Specifically, the results indicate that increased job demands may be associated with employee eating behaviours on a day-to-day basis, and that a good night's sleep could serve as a protecting factor that buffers the influence of morning job demands on evening unhealthy food consumption.

Discussion

The aim of this scoping study was to examine what is currently known about the associations between employee health behaviours (physical activity, sedentary behaviour, fruit and vegetable intake, sleep, alcohol consumption, and tobacco use) and specific constructs from the JD-R model (job demands, job resources, work engagement/disengagement, and burnout). This scoping study reveals that there is currently limited evidence for the association between health behaviours and JD-R model constructs in the context of studies which have specifically cited and employed the original JD-R model. This appears to be due to the scarcity of studies that have examined such associations. Of the available evidence it is apparent that the majority of studies conducted are cross-sectional in nature (five of nine included studies) which precludes any causal claims to be made regarding the associations between variables. As such, it remains unknown whether health behaviours are outcomes of JD-R constructs (e.g., that job demands or burnout prompt individuals to engage in health behaviours), or if engaging in health behaviours may lead individuals to perceive their job characteristics in a particular way.

Directions for Future Research

Due to the limited number of studies, it is important to determine in future research if some or all health behaviours considered in this review are associated with the JD-R constructs, and if so, how strongly and in what direction. Longitudinal study designs would be particularly helpful in this regard to determine time precedence among the constructs shown to be related. Evidently, the findings of the review suggest that it is important that future research examine associations between a larger range of health behaviours and a broader spectrum of JD-R constructs. There is a particular need to examine how sedentary behaviour, independent of physical activity, is related to JD-R constructs. Future

research could consider multiple health behaviours and work outcomes to determine how engaging in a combination of different health behaviours may be associated with JD-R constructs. To this end, one potentially useful avenue of future research is to consider unique conglomerations of JD-R concepts, and how these subpopulations differ on a broad range of health behaviours. Finally, the fact that burnout (De Beer et al., 2014) was associated with sleep difficulties and that good sleep quality was found to protect against increased job demands and unhealthy eating behaviours (Liu et al., 2017), highlights the importance of studying sleep behaviour as part of a range of health behaviours vis-à-vis JD-R model in employees.

The present research revealed that all studies had employed self-reported measures of health behaviours. In the future, it is critical that researchers employ objective measures to assess health behaviours. Indeed, objective measures do exist for several of the health behaviours included in this review (e.g., physical activity, sedentary behaviour, diet and sleep). For example, accelerometers such as hip and wrist-worn ActiGraphs and GeneActiv monitors are now popular validated tools in physical activity research (e.g., Roscoe, James, & Duncan, 2017). It is important to employ such measures because there is ample evidence showing that objective assessments of health behaviours (e.g., physical activity and sedentary behaviour) are subject to less bias when compared with self-reports (Castillo-Retamal & Hinckson, 2011; Sylvia, Bernstein, Hubbard, Keating, & Anderson, 2014). Importantly, adopting such methods in future research will also address the problem of common method variance (Podsakoff, MacKenzie, & Jeong-Yeon, 2003). Further, in the introduction to this study, a range of different possibilities for how health behaviours may be related to JD-R constructs were proposed. Although the studies included in this review did not allow for an examination of these possibilities, it would be worthwhile to test each of these in future research. This could facilitate the design of future conceptual models integrating health behaviours within JD-R.

Study Strengths and Limitations

This scoping study was subject to some limitations. First, studies that had employed or cited the JD-R model were sourced from a number of databases and were scanned by title and abstract for health behaviours of interest of this review. A reversed (i.e., developing and applying health

behaviour search terms to databases) and systematic approach (e.g., employing a second reviewer to review search terms and inclusion/exclusion decisions) to identify relevant studies is likely to provide more robust results for the limited evidence on these associations. For example, a full systematic review is expected to provide further evidence due to the broad scope and design. Second, increased familiarity with relevant literature revealed that studies investigating health behaviours in different populations have conceptualised and termed this cluster of behaviours as 'behaviour-related health risk factors' (Ahola et al., 2012) and even 'behaviours' (Cecil, McHale, Hart, & Laidlaw, 2014) making identification of relevant studies difficult. Limitations arising from the conceptualisation of health behaviours (i.e., the way in which health behaviours are termed) in the literature has been cited previously (e.g., dichotomisation of behaviours such as being sedentary or physically active or not; Byrne et al., 2016). The aforementioned limitations of this scoping study are balanced against some strengths. First, articles were sourced from a number of widely used databases in psychological research (CINAHL, PubMed, PsychINFO, PsychArticles, Scopus, Web of Science) providing a relatively broad scope to the searches. Second, this study investigated a diverse range of employee health behaviours and workplace constructs that have been shown to be relevant to the workplace but have yet to be explicitly mapped out in the literature by a review. Third, the workplace constructs investigated were covered by a theoretical framework (i.e., JD-R model), contrary to most studies typically investigating these associations (of which the majority have been atheoretical).

Conclusion

Findings suggest that research examining associations between health behaviours and JD-R constructs is limited in scope. The results of the review provide a platform for researchers to continue work examining how a range of health behaviours relate to JD-R constructs. It provides some directions for future research which may help elucidate the strengths of associations, directions of causality and function of health behaviours within the JD-R.

Chapter II Summary

The aim of this scoping review study was to map out the literature on what is known about the associations between a range of employee health behaviours (physical activity, sedentary behaviour, fruit and vegetable consumption, sleep, alcohol consumption, tobacco use) and selected constructs from the job demands-resources (JD-R) model (job demands, job resources, burnout, engagement) in studies citing and employing the original JD-R model. For this review, I employed Arksey and O'Malley's (2005) methodological framework to provide a narrative synthesis of the results. Searches were conducted across a number of databases to identify relevant articles in peer-reviewed journals and grey literature that had examined these associations. After removing duplicates, a total of 6,754 articles were identified and screened by title and abstract. Of these articles, only 65 were identified as potentially relevant and full-text screened. Only nine articles met the criteria and were included in the review. Following an assessment of quality and relevance (EPPI's Weight of Evidence; Gough, 2007), only two articles were judged to be of high relevance to the main research question. The findings of this study revealed there is currently limited evidence for these associations and may be used as a platform to continue examining how employee health behaviours relate to JD-R constructs.

CHAPTER III: IDENTIFYING JOB DEMANDS AND JOB RESOURCES TYPOLOGIES AND EXPLORING THEIR DIFFERENCES ON EMPLOYEE HEALTH BEHAVIOURS

Introduction

The job demands-resources (JD-R) model (Bakker & Demerouti, 2007; Demerouti & Bakker, 2011; Demerouti et al., 2001a, 2001b) is currently one of the most widely used frameworks of employee well-being. Within the context of the JD-R, strain and motivational characteristics are determined by demands (job) and resources (job and personal), respectively. While this heuristic builds on previous occupational well-being models, in contrast to these other models (e.g., Karasek's (1979) job demand-control model), JD-R theory has the advantage over these previous theories in that job characteristics are not specified, but all job characteristics can be classified as either job demands (i.e., aspects of the job that are associated with costs; e.g., work pressure, irregular working hours) or job resources (i.e., aspects of the job that reduce demands and costs and are associated with growth and development; e.g., job autonomy, supervisory support and feedback; Bakker & Demerouti, 2007; Demerouti et al., 2001a). The model is therefore suitable to aid understanding of well-being across a broad range of occupations. Specifically, the JD-R model authors propose that job demands, when excessive, are likely to lead to exhaustion and health problems, which is described as the health impairment process. In contrast, job resources trigger a motivational process leading to work engagement and performance. Work engagement is considered to be the opposite (or 'antidote') of burnout (Maslach, Schaufeli, & Leiter, 2001) and has been defined as the "positive work-related state of fulfilment that is characterised by vigour, dedication, and absorption" (Schaufeli & Salanova, 2007; Schaufeli, Salanova, González-Romá, & Bakker, 2002, p. 74). Additionally, it is proposed that interactions between job demands and job resources predict occupational well-being. As such, it is assumed that job resources may buffer the influence of job demands on job strain and consequently on burnout (e.g., Bakker, Demerouti, & Euwema, 2005). Further, job demands are proposed to strengthen the impact of job resources on work engagement (Bakker, Hakanen, Demerouti, & Xanthopoulou, 2007). More recently, the JD-R model was extended to include personal resources (Xanthopoulou et al., 2007), defined as aspects of the self, associated with resiliency and one's ability to control and

impact the environment successfully (Hobfoll et al., 2003). Personal resources have been found to moderate the relation between job resources and engagement/exhaustion by promoting engagement and protecting against exhaustion (Xanthopoulou et al., 2007).

Besides substantial empirical support for the main tenets of the JD-R model, there is considerable evidence showing the model predicts both health and organisational outcomes (Bakker & Demerouti, 2016; Bakker, Demerouti, Sand-Vergel, 2014; Demerouti & Bakker, 2011). For example, burnout has been shown to be associated with negative indices of employee physical (e.g., increased risk of future hospitalisation) and mental (e.g., depression) health (e.g., Melamed et al., 2006; Glise, Hadzibajramovic, Jonsdottir, & Ahlborg, 2010). In spite of the aforementioned evidence for the JD-R, it is noteworthy that almost all the research to date that has been conducted using the JD-R framework has employed a variable-centred approach (e.g., regression). This approach assumes that the variables specified in the JD-R relate to each other in the same way for all individuals, yet this expectation might not necessarily be the case. Person-centred approaches (e.g., latent profile analysis) examine whether some people cluster on a combination of variables in ways that are similar to each other yet different to other individuals. In other words, it is possible via person-centred analyses to identify distinct typologies of individuals such that one can identify sub-populations, including those who may be at risk of poor well-being. Focusing on people rather than variables means that techniques such as LPA can reveal whether typologies are predominantly quantitative or qualitative in nature (Wang & Hanges, 2011). While quantitatively different profiles differ on their absolute level on the variables used to create the cluster solution (same score level on all constructs, i.e., low, moderate or high), profiles that are qualitatively different in nature are characterised by different cluster shapes or structures (varying score levels across the profile indicators, e.g., low job demands, high job resources, high personal resources). A revision of the original JD-R model interactions of job demands and job resources, four different constellations of characteristics are possible: low demands/low resources indicating low strain and average motivation, low demands/high resources reflective of low strain and high motivation, high demands/low resources denoting high strain and low motivation, and high demands/high resources describing average strain/high motivation (Bakker &

Demerouti, 2007). This implies that according to the model, one would expect typologies to be primarily qualitatively, rather than quantitatively, different.

In one of only two studies which have examined JD-R typologies, Keller and colleagues (2016) identified constellations of job stressors and job resources in a large cross-sectional study (combined total N = 8,252) using samples of employees from four different nations. The results of the study showed two distinct profiles across all four samples (P1: low stressors and high resources, and P2: high stressors and low resources) and a third profile that was prevalent only among one employee sample (P3: moderate levels of stressors and resources). These findings partially support the tenets of JD-R model with P1 and P2 representing two of the four proposed constellations (low demands/high resources indicative of low strain and high motivation; and high demands/high resources indicative of high strain/high motivation, respectively). The third profile identified (P3) was not replicable across all samples (as opposed to P1 and P3) and therefore was excluded from subsequent analyses to identify how the profiles differed on external factors. These results suggested that typologies represented qualitative rather than quantitative differences. The typologies were subsequently validated by examining differences between the groups on employee well-being, health and performance outcomes. As expected, participants in P1 reported higher levels of job satisfaction, performance and health and lower levels of exhaustion compared to participants in P3.

The second cross-sectional study examining JD-R typologies among Belgian employees in the electricity sector (N = 461; De Spiegelaere, Ramioul, & Van Gyes, 2017) identified five different job profiles based on a LPA of perceptions of job demands (complexity, time pressure, emotional pressure, job insecurity, and job content insecurity) and resources (autonomy, contact opportunities, organising tasks, task completeness, and information provision). The largest job profile was labelled ‘low strain jobs’ (26%) (high job resources/low job demands), followed by ‘active jobs’ (23%) (high job resources/high job demands), ‘high strain jobs’ (20%) (low job resources/high job demands). The remaining two profiles were similar to the aforementioned profiles but with more discernible distinctions between the indicators of these profiles. The fourth largest profile was named ’very high strain jobs’ (16%) (low job resources/high job demands) and the smallest profile was named ‘very low strain jobs’ (15%) (high job resources/low job demands). Similar to the findings reported by Keller et

al (2016), the differences between profiles appeared to be qualitative (structure) rather than quantitative (scores) in orientation.

This initial work on person-centred analyses of JD-R assumptions has provided an initial insight into a core conceptual feature of this model (Bakker & Demerouti, 2007). It is likely that the variables specified by the JD-R model are not related to each other in the same way as originally assumed. However, there are two key considerations that require extension in future work on JD-R profiles. First, a key limitation of past work on employee profiles characterised by demands and resources is that researchers have excluded personal resources as indicators of sub-populations of individuals, which are a more recent yet key feature of the JD-R framework. Second, despite researchers having considered health outcomes vis-à-vis the JD-R model (e.g., long-term sickness absence) in variable-centred studies (e.g., Clausen, Nielsen, Gomes-Carneiro, & Borg, 2011), with regards to the two studies reviewed above which used person-centred analyses, none of these studies considered how groups may differ on health *behaviours*. Health behaviours differ from health outcomes in that the former are activities which promote, protect or maintain health (World Health Organization, 1998). Health behaviours can be health-enhancing (e.g., adequate physical activity) or associated with health risks (e.g., smoking) and therefore sometimes referred to as "risk behaviours".

The exclusion of health behaviours from the JD-R model is important given engagement in such behaviours are key modifiable determinants of health. In Australia, three risky health behaviours (tobacco use, high alcohol consumption and physical inactivity) and two negative health outcomes (high body mass index and high blood pressure) were found to be the five major risk factors contributing to the burden of disease that are preventable if exposure to modifiable risk factors is reduced (Australian Institute of Health and Welfare, 2011). Specifically, 13% of people aged 14 or older report smoking, 7.2% report consuming alcohol daily, 95% report not eating the recommended daily portions of fruits and vegetables, and 44% aged 18 to 64 report not reaching sufficient physical activity levels per week (Australian Institute of Health and Welfare, 2016). A meta-synthesis of health behaviour change interventions ($N = 62$) examining their efficacy showed increased engagement in healthy behaviours and decreased engagement in risky (or unhealthy) behaviours post-intervention with mean effect sizes ranging from small (0.08) to medium (0.45) (Johnson, Scott-Sheldon, & Carey,

2010). Another systematic review, meta-analysis and meta-regression of the effectiveness of interventions (N = 69) on multiple risky health behaviours showed that a combination of education (i.e., providing information about risks associated with specific behaviours) and skills training (i.e., teaching skills that will assist participants to decrease engagement in risky behaviours) were associated with small changes in diet and physical activity (Meader et al., 2017). These studies demonstrate that health behaviours are modifiable and therefore an important omission from research on the JD-R model.

Evidence suggests health behaviours directly impact individual health. For instance, smoking and its harmful effects for individual health are well known. In the year 2008 alone, smoking was estimated to have caused approximately 1.6 million deaths globally (Brawley, 2011). Similarly, physical inactivity has been estimated to cause six to 10 percent of all the major non-communicable diseases (Lee et al., 2012) and is comparable to other established risk factors such as smoking and obesity. The health benefits of regular physical activity on the other hand are well-established (Reiner, Niermann, Jekauc, & Woll, 2013; Warburton & Bredin, 2017) extending to the prevention of both primary and secondary diseases (Alves et al., 2016). As with physical activity, a healthy diet has been identified as a key factor for the prevention of chronic disease and sustained health throughout the lifetime (WHO, 2008). Past research has demonstrated the beneficial health effects of fruit and vegetable intake by linking increased consumption with a decreased risk of chronic diseases such as cancer and heart disease (Bize et al., 2007; Harding et al., 2008; Peto, 2011). The effects of alcohol consumption on health are more complicated as evidenced by the literature. A number of studies have supported that the relation between alcohol consumption and cardiovascular disease (Reynolds et al., 2003; Wulsin et al., 2003), as well as cardiovascular mortality (Di Castelnuovo et al., 2006; Ronksley et al., 2011), resembles a ‘j-shape’, indicating that light and moderate alcohol consumption is associated with lower mortality and cardiovascular disease as opposed to high alcohol consumption (which is associated with higher mortality and cardiovascular disease; Rostron, 2012). While the accuracy of the j-shaped curve has been questioned (e.g., Chikritzhs et al., 2009), research has suggested that high alcohol consumption is associated with type 2 diabetes, high blood pressure, as well as an increased incidence of various forms of cancer (Foster, 2007). Furthermore, a growing

concern for public health globally is sleep behaviour. This is not only due to the impairments (e.g., motivation, cognitive and emotional functioning; Irish et al., 2015) and risks associated with sleep deficit (e.g., increased risk for type 2 diabetes, cardiovascular disease and obesity; Cedernaes et al., 2015), but also because these risks to health persist even when symptoms are below the threshold for clinical diagnosis of sleep disorders (Banks & Dignes, 2007; Walker, 2009; Zaharna & Guilleminault, 2010).

Although health behaviours are not considered a component of JD-R, some health behaviours have been shown to relate to specific constructs embedded in the JD-R. Most of this research has focused on associations between burnout and distinct health behaviours including fast-food consumption, alcohol consumption and infrequent exercise (e.g., Moustou, Panagopoulou, Montgomery, & Benos, 2010). In relation to the different typologies stipulated by JD-R described previously (i.e., low demands/low resources, low demands/high resources, high demands/low resources and high demands/high resources; Bakker & Demerouti, 2007), it has yet to be determined if these profiles of individuals differ on a range of health behaviours. However, it would be reasonable to expect that they would differ on health behaviours. Specifically, a combination of high demands and low resources would indicate high strain without sufficient resources. Indeed, a review suggests that the presence of stress can act as a barrier to physical activity engagement (Stults-Kolehmainen and Sinha, 2014). Other evidence, including studies using a diary approach, shows that the presence of stress without sufficient resources may lead individuals to indulge in unhealthy eating behaviours, increased alcohol consumption (e.g., Mouchacca, Abbott, & Ball, 2013; Steptoe, Lipsey, & Wardle, 1998), and may increase smoking frequency among smokers (e.g., Salgado-García et al., 2015). Further, individuals reporting high stress are likely to have poorer sleep (Knudsen, Ducharme, & Roman, 2007). Thus, individuals with a profile characterised by relatively high job demands and low (job and personal) resources are likely to exhibit a poorer health behaviour profile than profiles with other combinations on these characteristics. Based on propositions of the JD-R model (Bakker & Demerouti, 2007), it would be expected that a group characterised by high demands/low resources

would also experience greater levels of burnout and lower levels of work engagement (providing validation for the hypothesised profiles).

Study Aims and Hypotheses

The overall aim of this study was to identify typologies of demands (i.e., job demands) and resources (i.e., job resources and personal resources) and explore their differences on burnout, engagement, and health behaviours using a person-centred approach (i.e., LPA). I expect that different typologies (i.e., profiles) will be observed based on employees' perceptions of demands and resources. Based on JD-R model propositions and the results of previous studies (e.g., Keller et al., 2016; De Spiegelaere et al., 2017), I hypothesise that the differences observed between the profiles are likely to be in kind (i.e., qualitative differences) rather than in degree (i.e., quantitative differences) (H1). I also expect that the profiles identified based on employees' perceptions of demands and resources will reveal differences in reported burnout and engagement as well as in the levels of health behaviours. Specifically, employees who report (relatively) high job demands and low levels of job resources are likely to report higher levels of burnout, lower levels of engagement and poorer health behaviours (low levels of physical activity, high levels of sedentary behaviour, low levels of fruit and vegetable consumption, high levels of alcohol consumption and possibly smoking) than participants in other profiles (H2).

Methods

Participants

Data were collected from four hundred and fifty nine employees (N = 459) in typically sedentary occupations (i.e., desk jobs) from a number of organisations based in Western Australia (WA) via an online survey hosted on the Qualtrics online platform (https://www.qualtrics.com/au/). A large portion of the sample (n = 216) consisted of members of a national training provider (Australian Institute of Management) and the remaining participants (n = 183) were professionals employed by other organisations who met the study criteria. However, only data from three hundred and ninety nine (n = 399) participants were retained for the main analyses; participants (n = 60) with over 20% of missing data on key variables were excluded. The final sample included 133 male (33.3%) and 266

female employees (66.7%), with an average age of 44 years (*SD* = 12.79). The majority of the sample was Caucasian (82%), followed by European (8.8%), Asian Pacific (3.0%), Aboriginal/Torres Strait Islander (0.3%), and African (0.3%). The remaining participants (5.8%) identified as 'Other' (4.4%) or indicated that they preferred to keep their ethnicity anonymous (1.2%). In terms of educational level, the majority of participants indicated they had achieved a bachelor's degree (37.1%), followed by master's a degree (14.0%), certificate III/IV (13.0%), advanced diploma or diploma (11.8%), graduate diploma or graduate certificate (6.8%), certificate I/II (6.5%), upper secondary schooling without qualification (6.5%) and with qualification (4.3%). In terms of job type, most of the participants reported belonging in the managers and administrators category (46.6%); followed by professionals (32.3%); intermediate (6.3%) and advanced (6.0%) clerical, sales and service workers; associate professionals (3.8%); tradespersons and related workers (1.8%); elementary clerical, sales and service workers (1.8%); labourers and related workers (1.0%); and intermediate production and transport workers (0.4%). A total of 35 individuals (8.8%) reported currently smoking in the retained sample. The inclusion criteria for the study required that participants (a) were 18 years of age or older, (b) were proficient in English (if English was not the participant's native language), (c) were currently employed (either part-time or full-time), (d) occupation required them to remain sedentary for the largest part of the workday, and (e) lived in Australia.

Measures

Demographic information and existing physical/mental health conditions. Demographic information collected included gender, ethnicity (measured according to the Australian Standard Classification of Cultural and Ethnic Groups), date of birth, educational level, and type of job (measured according to the Australian and New Zealand Standard Classification of Occupations). Further, two items were included to determine whether any of the participants were living with a diagnosed physical (e.g., diabetes, arthritis, heart or pulmonary problems) or mental health (e.g., depression, anxiety disorder, attention deficit hyperactivity disorder, autism spectrum disorder) condition. Instructional sets for all lifestyle behaviours and work-related outcomes were adapted from

the original measures so that participants would consider their responses in relation to the past four weeks.

Physical activity and sedentary behaviour. Physical activity (PA) was measured using the International Physical Activity Questionnaire – Short Form (IPAQ-SF) (Craig et al., 2003). The IPAQ is one of the most widely used PA questionnaires and is available in both long (IPAQ-LF) and short (IPAQ-SF) forms. The IPAQ-SF consists of nine items and tracks individual activity on four levels (vigorous-intensity activities, moderate-intensity activities, walking and sitting). Example items include "During the last 4 weeks, on how many days per week did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling," and "During the last 4 weeks, on how many days per week did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking". The validity of the IPAQ-SF has been shown to be just below acceptable standards when measured against objective measurements of PA. For example, in their systematic review, Lee and colleagues (2011) included 23 validation studies of the IPAQ-SF and reported that the correlations for total PA measured using the IPAQ-SF and objective measures (i.e., accelerometer devices) ranged from 0.09 to 0.39 (the minimum standard for objective PA measures is 0.50). Notwithstanding, both long- and short-form versions of the IPAQ are the most widely used physical activity questionnaires (Van Poppel et al., 2010). Sedentary behaviour (SB) was measured using one IPAQ-SF subscale item ("The next question is about the time you spend sitting on weekdays during the last 4 weeks. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television").

Sleep quality and duration. Sleep quality and duration were assessed employing two (of nineteen) items from the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The two items assessed sleep quality and sleep quantity. Sleep quality was assessed using one item asking participants to rate their overall sleep quality over the past four weeks scored on a 4-point scale (1 = *very good;* 4 = *very bad*). This item was reversed for interpretation purposes. Sleep duration was also assessed using a one-item measure asking participants to report the number of hours they have typically slept each night in the past four weeks. The remaining 17 items of the PSQI

related to other components of sleep that were not considered in this study (e.g., sleep latency, use of sleep medication, daytime dysfunction, etc.). The PSQI has previously been employed to measure sleep quality in occupational health research (e.g., Clinton, Conway, & Sturges, 2017; Loft & Cameron, 2014) and has previously demonstrated satisfactory psychometric properties ($\alpha = 0.83$; test-retest reliability coefficient = 0.85; Carpentera & Andrykowskia, 1998) and good internal test-retest reliability (Grander, Kripke, Yoon, & Youngstedt, 2006).

Fruit and vegetable consumption. Fruit and vegetable consumption (FVC) was measured using two self-report items adopted from Katz and colleagues' (2014) study. Participants were asked how many servings of fruits/vegetables they have consumed on average per day over the past four weeks. No threshold was set for minimum FVC, instead, the following information regarding servings and portions was provided to participants in order to assist their calculations: "1 serving of fruits/vegetables is equal to ½ cup of chopped, fresh, or canned fruits/vegetables".

Alcohol consumption. The Alcohol Use Disorders Identification Test – Consumption (AUDIT-C) is a three-item measure employed to assess alcohol consumption (Bradley et al., 2007). The AUDIT-C is the short version of the original 10-item AUDIT measure (Babor, De La Fuente, Saunders, & Grant, 1989) with the versions performing similarly in terms of successful identification of alcohol misuse (Kriston, Holzel, Weiser, Berner, & Harter, 2008; Reinert & Allen, 2007). The AUDIT-C aims to identify typical frequency, quantity of drinking and heavy drinking and/or active alcohol abuse and dependence. The three items are: "How often do you have a drink containing alcohol?", "How many standard drinks containing alcohol do you have on a typical day?" and "How often do you have six or more drinks on one occasion?" Higher scores indicate hazardous drinking or active alcohol use disorders. The three items of the AUDIT-C were scored on a five-point scale to assess frequency of alcohol consumption, ranging from never (1) to four or more times/week (5). A precursor item asking whether participants consumed alcohol or not preceded the AUDIT-C measure in the online survey, so only individuals who indicated they consumed alcohol were asked to respond to the three AUDIT-C questions. The AUDIT-C is a validated measure for the identification of alcohol misuse in primary care settings (Bradley, Kivlahan, & Williams, 2009; Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998).

Tobacco-related behaviour. Tobacco consumption was assessed in those participants who described themselves as current smokers. Participants that described themselves as non-smokers skipped the tobacco-related behaviour measures altogether. Nicotine dependence was assessed using a total of nine items consisting of the six-item Fagerstrom Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) which has been previously been employed in occupational health research (e.g., Peretti-Watel, Constance, Seror, & Beck, 2009). Tobacco use was assessed using a three-item tobacco use scale (Molina, Fernandez , Delgado, & Martin, 2010). Example items for nicotine dependence include "In the past 4 weeks, how many cigarettes have you smoked per day?" and "In the past 4 weeks, have you found it difficult to smoke in places where it is banned?" Example items for tobacco use include "In the past 4 weeks, which cigarette has given you the greatest satisfaction?" and "Do any of the people you live with smoke?" This combined nine-item tobacco consumption measure (six-item nicotine dependence and three-item tobacco use scales) was first employed by Molina and colleagues (2010) and was found to have both high sensitivity and specificity (sensitivity = 85.3%; specificity = 95.3%) using a biochemical parameter (cotinine concentration in participants' saliva) assessing the correlations between the questionnaire and cut-off points for cotinine. Nicotine dependence items from the Fagerstrom Test were scored on four-point scales that corresponded to each item to assess nicotine dependence, for example, "1-10," "11-20," "21-30," "30+". Higher scores on the questionnaire indicate higher nicotine dependence. Strong correlations with the cotinine test were found (Kappa = 81%) and used to interpret the differences between questionnaire and saliva scores during the validation process.

Personal resources. The Psychological Capital Questionnaire-12 (PCQ-12) (Luthans, Avolio, Avey, & Norman, 2007; Luthans et al., 2006; Luthans, Youssef, & Avolio, 2007) assesses individuals' perceptions of self-efficacy, optimism, hope and resilience. The scale consists of 12 items and was scored on a six-point scale (1= *Strongly disagree*; 6 = *Strongly agree*). Example items include "In the past 4 weeks, I have met the work goals I have set for myself" and "I have looked on the bright side of things regarding my job". The PCQ-12 has demonstrated consistently high levels of internal reliability across a number of countries (ranging from .84 to .92; Wernsing, 2014).

Job demands and job resources. The Job Content Questionnaire (JCQ) (Karasek, Brisson, Kawakami, Houtman, & Bongers, 1998) is a 49-item self-administered psychosocial job assessment tool employed to measure job demands and resources. Job demands include psychological job demands (e.g., "My job requires working very fast"), physical job demands (e.g., "My job requires lots of physical effort") and job insecurity (e.g., "My job security is good") subscales. Job resources include skill discretion (e.g., "My job requires a high level of skill"), decision authority (e.g., "My job allows me to make a lot of decisions on my own"), macro-level decision authority (e.g., "I have a significant influence over decisions in my work group of unit"), supervisor social support (e.g., "My supervisor is concerned about the welfare of those under him"), and co-worker social support (e.g., "People I work with are competent in doing their jobs"). All JCQ subscales are scored on a four-point scale (1=*Strongly disagree*; 4=*Strongly agree*). The validity and reliability of the JCQ has been supported across a number of jobs and countries (Alexopoulos, Argyriou, Bourna, & Bakoyannis, G., 2015; Amin, Quek, Oxley, Noah, & Nordin, 2015; Cheng, Luh, & Guo, 2003; Choobineh, Ghaem, & Ahmedinejad, 2011; Li, Yang, Liu, Xu, & Cho, 2004).

Burnout. The Maslach Burnout Inventory – General Survey (MBI-GS) (Maslach, Jackson, & Leiter, 1996) is an antecedent of the original Maslach Burnout Inventory – Human Services Survey (MBI-HSS) (Maslach & Jackson, 1986) which was initially developed to assess occupational burnout in individuals in the human services. The MBI-GS contains 16 items and was later adapted following the need to assess burnout in other occupations without direct contact with service recipients or with only casual contact with people (Maslach et al., 1996). The MBI-GS measures individuals' feelings about their occupation on a spectrum ranging from engagement to burnout consisting of three factors (i.e., exhaustion, professional efficacy and cynicism) and is scored on a 7-point scale: "Never" (1), "A few times a year" (2), "Once a month or less" (3), "A few times a month" (4), "Once a week" (5), "A few times a week" (6), "Every day" (7). Example items include "I have felt emotionally drained from my work" (exhaustion factor), "I have become more cynical about whether my work contributes anything" (cynicism factor), and "In my opinion, I have been good at my job" (professional efficacy factor). Studies have shown support for the construct validity of the MBI-GS across a number of

countries (Bria, Spanu, Baban, & Dimitrascu, 2014; Kitaoka-Higashiguchi et al., 2004; Richardsen & Martinussen, 2005).

Work engagement. The Utrecht Work Engagement Scale – 9 (UWES-9; Schaufeli, Bakker, & Salanova, 2006) was employed to measure work engagement. The UWES-9 instrument consists of three factors (i.e., vigour, dedication and absorption) and scores range from one (*Strongly disagree*) to six (*Strongly agree)*. Example items include "At my work, I feel bursting with energy" (vigour factor), "Time flies when I'm working" (absorption factor), and "I am enthusiastic about my job" (dedication factor). In terms of construct validity, a three-year longitudinal study utilising a total of five Finish occupational samples (N = 9,404) examined both the factor structure and factorial group (i.e., whether the structure of the scale remains the same across different occupational groups), and the longitudinal invariance (i.e., whether the structure of the scale remains the same across different measurement points) of both the long (17-item) and short (nine-item) versions of the UWES (Seppala et al., 2009). The results showed that the short version of the scale remained unchanged when compared to the long version, demonstrated good construct validity and was recommended in future research.

Work performance, absenteeism, and presenteeism. Work performance, absenteeism, and presenteeism were measured using selected items (11 items) from the World Health Organization's (WHO) Health and Work Performance Questionnaire (HPQ) (Kessler et al., 2003; Kessler et al., 2004). Absenteeism was measured using eight items. An example item is "In the past 4 weeks, how many days did you miss an entire work day because of problems with your physical or mental health?" (absenteeism); "How would you rate the usual performance of most workers in job similar to yours? and "How would you rate your overall job performance on the days you worked during the past 4 weeks (28 days)" (presenteeism; i.e., 2 items); and "How would you rate your usual work performance over the past 4 weeks?" (work performance; i.e., 1 item). Responses to items were either scored on a 11-point scale ranging from 0 (*Worst performance*) to 10 (*Best performance*), or were free-entry (e.g., "How many hours does your employer expect you to work in a typical 7-day week?"). The HPQ has shown excellent reliability and validity as well as sensitivity to change (Kessler et al., 2004).

Procedure

Recruitment was carried out over a nine-month period (January – September 2016) encompassing different recruitment strategies. A number of WA-based organisations identified as suitable for the study (vis-à-vis sector, size, and location) were approached using a variety of methods (e.g., cold-emailing, cold-calling, approaching staff members at industry events) aiming to interest senior managers to try to gain access to employees in their organisations. The objective was to collect all data from several large organisations by distributing the survey internally (a top-down approach). Information about WA organisations was obtained from the Book of Lists which is a comprehensive business-listing document that includes details of more than 3,200 West Australian based organisations (Book of Lists, 2014). The recruitment strategy was later expanded from only targeting organisations to also targeting individual employees, and from restricting the sample to WA residents to recruiting throughout Australia as the initial strategy did not lead to adequate recruitment. Information about the study (i.e., aims and criteria, principal investigator's contact details) was shared both with organisations who participated and distributed the survey internally, but also on the researcher's online LinkedIn professional network (https://www.linkedin.com/), on Curtin University's newsletter and posters on the university's campus enabling the researcher to reach professionals beyond existing networks (for flyer details see Appendix E). In addition to use of the above recruitment strategies, personal and professional contacts of the researchers were informed of the study and recruitment continued through snowball sampling. Interested participants emailed the researcher and requested more information about the study. Participant consent was obtained in the form of a check box that appeared at the beginning of the online survey. Participants could not proceed to the survey if they had not ticked the box indicating they (i) understood what was required to take part in the study, (ii) had received information regarding the study, and (iii) had had an opportunity to ask questions. The study was approved by Curtin University's Human Research Ethics Committee (RDHS-271-15).

Data Analyses

Guided by recommendations for mixture modelling (Asparouhov & Muthén, 2013; Lanza, Tan, & Bray, 2013), I took a two-step approach to the primary analyses. First, I used latent profile analysis (LPA) with a robust maximum likelihood estimator (MLR) to classify participants who share a common pattern of job resources, job demands, and personal resources into latent subpopulations. LPA is a probabilistic model-based clustering approach that permits the identification of homogenous subgroups within a mixture distribution of continuous indicators (Wang & Hanges, 2011). Key strengths of LPA are that it quantifies uncertainty of class membership and therefore accounts for measurement error in the statistical model, and provides information in the form of posterior probabilities of class membership to evaluate the adequacy of the classification structure (Collins & Lanza, 2010). Given the exploratory nature of this study, I took an inductive approach whereby I compared a range of models that varied in the number of latent profiles to determine the structure that best represented a balance between model fit and parsimony (Nylund, Asparouhov, & Muthén, 2007). I used 10000 random sets of starting values each with 100 iterations, and retained the best 250 solutions for final stage optimization (Meyer & Morin, 2016). Model comparisons were assessed using a combination of relative fit indices (Akaike Information Criteria [AIC]), Bayesian Information Criteria [BIC] and its sample size adjusted version [ABIC]), ratio test (Lo-Mendell-Rubin likelihood [LMR] and Bootstrap likelihood [BLRT] with 200 draws to estimate the *p* value of the test), and an indicator of the precision of class allocation (entropy). A better fitting model is supported by lower values on the relative fit indexes, a statistically significant ratio test, and entropy values that are closest to 1 and larger in comparison to other class structures (Nylund et al., 2007). Aligned with simulation evidence (Diallo, Morin, & Lu, 2016), I prioritized the BIC under conditions of high entropy (e.g., > .80) and the ABIC and BLRT under conditions of low entropy (e.g., <. 50). I also analysed graphical depictions of relative fit indexes through "elbow plots" to examine the gains from additional profiles, as ratio tests are influenced heavily by sample size (Marsh, Lüdtke, Trautwein, & Morin, 2009; Morin et al., 2011). These statistical criteria were complemented by substantive interpretations of the solutions (e.g., congruence with theoretical perspectives) and consideration of sample sizes within each cluster (e.g., profiles < 5% of total sample considered spurious) (Hipp & Bauer, 2006; Lubke & Neale, 2006; Marsh et al., 2009). Second, I used multinomial regression within

an LPA framework and the automatic three-step approach to assess outcomes of latent profile membership on burnout, engagement and lifestyle factors; specifically, the DU3STEP command modeled these variables as auxiliary outcomes with unequal means and variances (Asparouhov T, Muthén, 2013). With this approach, auxiliary variables are excluded from the classification model, yet they are assessed in relation to the final model and therefore account for most likely class membership and classification error (Morin et al., 2011; Wang & Hagnes, 2011). All analyses were performed using M*plus* 7.4 (Muthén & Muthén, 1998-2015) using full information maximum likelihood to make use of all available data.

Results

Descriptive Statistics and Bivariate Correlations

Means, standard deviations and bivariate correlations for all study variables are presented in Tables 1 and 2. With the exception of alcohol consumption ($\alpha = .60$), all scales had excellent internal reliability evidence ($\alpha > .75$) (Lance, Butts, & Michels, 2006; see Table 3). There were no missing values in the dataset as the survey was completed electronically, and all survey items were programmed to 'force response' (i.e., required respondents to anwer each survey item before being able to proceed to the next one). In terms of burnout and engagement, job resources (skill discretion, decision authority, supervisor support, co-worker support) revealed both low and moderate positive associations with work engagement (vigour, dedication and absorption dimensions), and both low and moderate negative associations with burnout (cynicism and exhaustion dimensions). Conversely, job demands (psychological job demands, job insecurity) showed low and moderate positive associations with burnout (cynicism and exhaustion dimensions). In terms of health behaviours, job demands (physical job demands, psychological job demands, job insecurity) revealed weak positive associations with vigorous PA and walking, as well as total (i.e., walking, moderate and vigorous) PA; and weak negative associations with sleep quality, sleep duration and vegetable consumption. Job resources (decision authority, skill discretion, supervisor and co-worker support) revealed moderate positive associations with sleep quality, fruit and vegetable consumption, as well as tobacco consumption.

Table 1

Descriptive Statistics (Means, SD, Sample Range, Skew and Kurtosis Values) for Job Demands (JCQjd), Job Resources (JCQsd, JCQda, JCQsup, JCQcow), Personal Resources (PsyCapR, PsyCapH, PsyCapE, PsyCapO), Burnout (MBIE, MBIP, MBIC) and Engagement (UWESV, UWESD, UWESA).

`		Range					
	N	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
PsyCapR	401	1.00	6.00	4.5503	.81157	-.903	1.981
PsyCapH	401	1.00	6.00	4.7273	.77059	-1.111	3.297
PsyCapE	401	1.00	6.00	4.6899	.95801	-.949	.944
PsyCapO	401	1.00	6.00	4.5037	.90065	-.893	1.252
MBIE	401	1.00	7.00	3.8838	1.56319	.205	-1.026
MBIP	401	2.33	7.00	5.5012	1.00101	-.646	-.235
MBIC	401	1.00	7.00	3.1845	1.62747	.660	-.475
UWESV	401	1.00	6.00	3.6658	1.11318	-.320	-.377
UWESD	401	1.00	6.00	4.4381	1.01385	-.865	.998
UWESA	401	1.00	6.00	4.3990	.88529	-.712	1.370
JCQsd	402	1.00	4.00	2.9171	.53685	-.781	1.326
JCQda	401	1.00	4.00	2.9426	.63664	-.412	.384
JCQsup	401	1.00	5.00	3.0218	.80680	.030	.831
JCQcow	401	1.50	4.00	3.0517	.46567	-.353	.830
JCQjd	403	.00	4.00	2.7047	.53944	-.293	2.571
JCQins	401	3.00	13.00	5.4663	1.85997	.979	1.372
JCQphy	401	1.00	4.00	1.5461	.57523	1.344	2.151

Table 2
Intercorrelations Matrix for JD-R Constructs and Health Behaviours.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	IPAQvig	1	.47	.23	.84	-.25	0.02	.12	.07	.04	.01	-.01	-.03	.00	.25	.06	.06	-.01	.07	.11	.15	.09	.10	-.08	.07	-.03	.10	.10	.06
2	IPAQmod			.25	.73	-.22	-.04	.07	.11	.04	.16	.01	-.01	-.04	.18	.04	.04	.07	.02	.16	.15	.13	.15	-.02	.11	-.07	.12	.10	.12
3	IPAQwalk				.64	-.12	-.03	-.06	.04	.11	.04	.02	.03	-.03	.33	-.01	.03	.02	.03	.02	.02	.05	.07	.08	.09	.03	.07	.07	.09
4	IPAQtot					-.28	-.02	.08	.01	.05	.01	.01	.01	-.03	.36	.03	.06	.08	.07	.15	.15	.13	.15	-.03	.10	-.03	.12	.10	.08
5	IPAQsit						.06	.04	.02	.02	-.13	.06	.00	-.08	-.24	.04	.04	.10	.03	-.01	-.03	.01	-.02	-.03	-.06	-.04	-.10	-.04	-.02
6	Sleepd							.42	-.03	-.02	-.12	.10	-.11	-.13	-.04	.01	.05	.04	.00	.04	.04	.04	.04	-.14	-.01	-.05	.05	-.03	-.10
7	Sleepq								.05	-.02	-.10	-.02	-.18	-.05	-.06	.10	.14	.12	.15	.12	.05	.16	.13	-.33	.06	-.20	.20	.08	.04
8	Fruitc									.61	-.09	-.04	.08	.06	.06	-.03	-.10	.03	-.02	.01	-.03	.02	-.02	.03	-.02	.01	.05	-.00	.04
9	Vegc										.06	.01	.07	.12	.12	-.10	-.11	-.06	-.05	-.03	-.02	-.03	-.05	.06	-.04	.13	-.07	-.09	-.06
10	Smok											.19	.03	.18	.16	-.10	-.07	.01	-.09	.02	-.04	-.06	-.08	.14	-.04	.09	-.10	-.09	-.13
11	AUDITC												-.04	.05	.04	-.07	-.01	.06	.02	.02	.03	.01	-.04	.07	-.08	.10	-.07	-.14	-.11
12	JCQjd													.09	.06	.04	-.06	-.25	-.16	-.15	-.08	-.06	-.13	.47	.10	.22	-.16	-.09	.06
13	JCQins														.07	-.15	-.16	-.14	-.20	-.16	-.14	-.13	-.24	.10	-.14	.16	-.12	-.15	-.10
14	JCQphy															-.18	-.17	-.12	-.09	-.08	-.14	-.14	-.03	.06	-.04	.09	.02	-.06	-.11
15	JCQsd																.58	.31	.26	.37	.35	.40	.49	-.21	.42	-.49	.52	.68	.59
16	JCQda																	.34	.26	.35	.37	.43	.44	-.22	.34	-.41	.42	.49	.38
17	JCQsup																		.36	.25	.25	.25	.36	-.24	.21	-.34	.30	.34	.22
18	JCQcow																			.17	.18	.14	.25	-.20	.14	-.28	.23	.27	.23
19	PsyCapR																				.70	.64	.71	-.31	.45	-.43	.50	.54	.40
20	PsyCapH																					.61	.65	-.20	.47	-.30	.42	.47	.40
21	PsyCapE																						.63	-.32	.48	-.39	.50	.46	.42
22	PsyCapO																							-.38	.48	.55	.61	.66	.64
23	MBIE																								-.14	.66	-.55	.42	-.20
24	MBIP																									-.38	.45	.55	.41
25	MBIC																										-.68	-.73	-.47
26	UWESV																											.75	.58
27	UWESD																												.69
28	UWESA																												1

Note. Personal Resources (PsyCap), Job Demands (JCQjd), Job Resources (JCQsd, JCQda, JCQsup, JCQcow), Burnout (MBI), Engagement (UWES), Physical Activity (IPAQ), Sleep (Sleepq, Sleepd), FVC (Fruitc, Vegc), Tobacco (Smoke) and Alcohol Consumption (AUDITC). *G*rey shade = statistically significant estimate at $p < .05$.

Table 3

Internal Reliability Estimates for personal resources (PsyCap), job demands (JCQjd, JCQphy, JCQins), job resources (JCQsd, JCQda, JCQsup, JCQcow, JCQjd, JCQphy), burnout (MBI), engagement (UWES) and alcohol consumption (AUDITC).

	Chronbach's Alpha	No. of items
Personal resources (PsyCap)	.897	12
Job resources subscale (JCQsd)	.807	6
Job resources subscale (JCQda)	.766	3
Job resources subscale (JCQsup)	.917	6
Job resources subscale (JCQcow)	.830	6
Job insecurity (JCQins)	.653	5
Job demands (psychological) (JCQjd)	.745	5
Job demands (physical) (JCQphy)	.881	5
Burnout (MBI)	.815	16
Engagement (UWES)	.914	9
Alcohol consumption measure (AUDIT-C)	.596	3

Latent Profiles of Demands and Resources

An overview of the fit indices for the LPA models is provided in Table 4. I tested *k* profiles consecutively starting with a two-profile structure through to a five-profile solution; I ceased the model building approach here because both the four-profile and five-profile solutions were not positive definite and therefore inadmissible, owing to a small number of participants ($n = 3$) within a single latent subgroup. There was a high level of classification accuracy of both the two-profile and three-profile solutions, with average posterior probabilities of class membership in excess of .90. As the entrophy value exceeded .80 in both structures, I relied on the BIC (Diallo et al., 2016) and the substantive interpretability of both the two-profile or three-profile solutions through an inspection of the standardised and raw scores of each indicator. From a statistical standpoint, the BIC value was lowest for the three-profile solution. An inspection of the absolute (see Figures 4.1 and 4.2) and standardised indicator scores (see Figures 4.3 and 4.4) revealed the addition of a third subgroup who was qualitatively different and substantively meaningful (i.e., an 'average' worker). As such, I retained the three-profile solution as the best fitting representation of the data.

In terms of absolute scores, the largest profile ($n = 217$, 54.39%) encompassed individuals who reported moderate-to-high levels of personal resources ($4.34 < M > 4.55$), moderate levels of job resources ($2.81 < M > 3.01$), and low-to-moderate levels of job demands ($1.55 < M > 4.05$). An

inspection of the standardised estimates indicated that these individuals reported moderate levels of demands and resources that were slightly below the average of the total sample. I labelled these individuals *balanced*. The second largest profile (n = 143, 35.84%) represented employees who reported high absolute scores of personal resources (5.17 < M > 5.39), moderate levels of job resources (3.16 < M > 3.35), and low-to-moderate levels of job demands (1.46 < M > 3.60). When considered in relation to the sample means, these employees reported high levels of personal resources, moderate-to-large amounts of job resources that were above average, and average levels of job demands. I labelled these employees as *resourceful*. The smallest profile (n = 37, 9.77%) captured people who reported moderate absolute levels of job resources (2.18 < M > 2.72) and personal resources (2.88 < M > 3.54), alongside low-to-moderate levels of job demands (1.85 < M > 4.51). An inspection of the standardised estimates indicated that these individuals reported low levels of job and personal resources alongside moderate-to-large amounts of job demands relative to the total sample. I labelled these individuals as *minimally resourced.*

Table 4
Fit Statistics of Latent Profile Analyses.

	AIC	BIC	ABIC	LMR LR test *p* value	ALMR LR *p* value	Entrophy
2-class	11714.86	11850.48	11742.60	.007	.008	.889
3-class	11463.29	11646.79	11500.83	.182	.185	.817
4-class*	11299.14	11530.50	11356.46	.078	.080	.858
5-class*	11188.93	11468.16	11246.04	.409	.414	.872

Note. Asterisk (*) indicates not positive definite matrix (due to a class with n=3).

Profile Differences in Burnout, Engagement and Health Behaviours

To understand the nature of profile membership, I first explored differences on burnout and engagement between the three latent subgroups (see Table 5). Minimally resourced profile members reported higher levels of exhaustion and cynicism, and lower levels of professional efficacy, vigour, dedication, and absorption than balanced and resourceful profile members. In turn, balanced profile members reported higher levels of exhaustion and cynicism, and lower levels of professional efficacy, vigour, dedication, and absorption than resourceful profile members. Collectively, these findings

indicate that there are salient differences between these three profiles across all dimensions of burnout and engagement. I also identified several salient differences in health behaviours between the latent profiles (see Table 6). Resourceful profile members reported higher levels of vigorous and moderate physical activity, sleep quality, and lower FVC and lower levels of smoking than balanced profile members; and higher levels of moderate physical activity, sleep duration and quality, and fruit consumption, but lower levels of vegetable consumption and smoking than minimally resourced profile members. Finally, balanced profile members reported higher levels of moderate physical activity, sleep duration and quality, and alcohol consumption, but lower levels of fruit consumption than minimally resourced profile members. The conceptual paths supported by the results are presented in Model 1 (Figure 3.1).

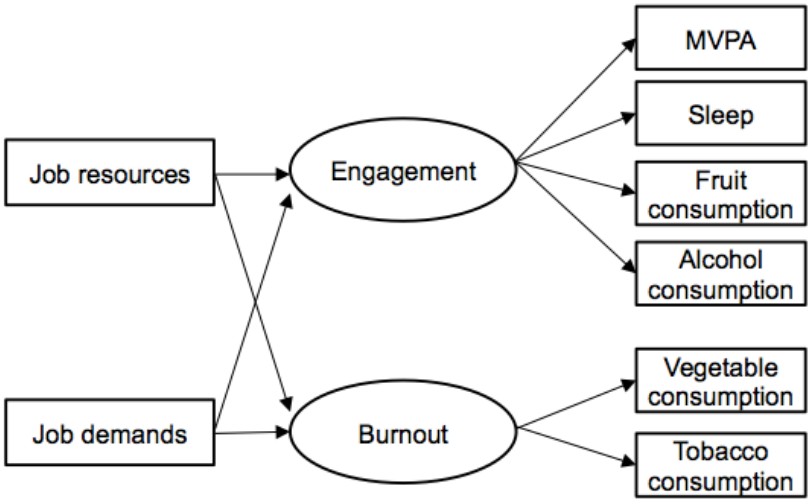

Figure 3.1. Model 1 highlighting the conceptual pathways of job demands, job resources, burnout and engagement to health behaviours.

Table 5
Latent Profile Differences in Burnout and Engagement (N = 399).

	N	M	SE	Minimally Resourced	Balanced	Resourceful
				MBIexhaustion		
Minimally Resourced	39	5.12	.30	n/a		
Balanced	143	4.19	.13	.006	n/a	
Resourceful	217	3.08	.20	<.001	<.001	n/a
				MBIprofessional efficacy		
Minimally Resourced	39	4.34	.19	n/a		
Balanced	143	5.24	.07	<.001	n/a	
Resourceful	217	6.21	.08	<.001	<.001	n/a
				MBIcynicism		
Minimally Resourced	39	5.28	.32	n/a		
Balanced	143	3.58	.11	<.001	n/a	
Resourceful	217	1.98	.10	<.001	<.001	n/a
				UWESvigor		
Minimally Resourced	39	2.19	.15	n/a		
Balanced	143	3.41	.07	<.001	n/a	
Resourceful	217	4.45	.09	<.001	<.001	n/a
				UWESdedication		
Minimally Resourced	39	2.81	.19	n/a		
Balanced	143	4.26	.06	<.001	n/a	
Resourceful	217	5.19	.07	<.001	<.001	n/a
				UWESabsorption		
Minimally Resourced	39	3.23	.17	n/a		
Balanced	143	4.29	.06	<.001	n/a	
Resourceful	217	4.89	.07	<.001	<.001	n/a

Table 6
Latent Profile Differences on Health Behaviours.

	M	SE	Minimally Resourced	Balanced	Resourceful
			IPAQvigorousPA (n = 381)		
Minimally Resourced	1197.66	226.48	n/a		
Balanced	995.64	79.51	.407	n/a	
Resourceful	1799.04	222.49	.058	.001	n/a
			IPAQmoderatePA (n = 369)		
Minimally Resourced	187.24	47.28	n/a		
Balanced	332.88	27.13	.007	n/a	
Resourceful	859.62	174.4	<.001	.002	n/a
			IPAQwalking (n = 375)		
Minimally Resourced	965.86	273.54	n/a		
Balanced	674.08	74.03	.30	n/a	
Resourceful	841.00	118.33	.68	.23	n/a
			IPAQsitting (n = 352)		
Minimally Resourced	7.25	.58	n/a		
Balanced	7.94	.23	.27	n/a	
Resourceful	7.75	.28	.43	.64	n/a
			Sleep Duration (n = 393)		
Minimally Resourced	6.35	.17	n/a		
Balanced	6.81	.07	.02	n/a	
Resourceful	6.80	.10	.02	.97	n/a
			Sleep Quality (n = 399)		
Minimally Resourced	2.40	.12	n/a		
Balanced	2.72	.05	.02	n/a	
Resourceful	2.89	.07	<.001	.045	n/a
			Fruit Consumption (n = 375)		
Minimally Resourced	4.70	.70	n/a		
Balanced	1.47	.07	<.001	n/a	
Resourceful	2.35	.18	.001	<.001	n/a
			Vegetable Consumption (n = 396)		
Minimally Resourced	5.15	.90	n/a		
Balanced	4.89	.36	.80	n/a	
Resourceful	3.05	.14	.02	<.001	n/a
			Tobacco (n = 399)		
Minimally Resourced	1.74	.18	n/a		
Balanced	1.70	.08	.86	n/a	

Resourceful	1.26	.05	.01	<.001	n/a
			Alcohol (n = 325)		
Minimally Resourced	6.45	.27	n/a		
Balanced	7.27	.18	.01	n/a	
Resourceful	6.84	.20	.24	.16	n/a

Note. The 3-step approach in Mplus uses listwise deletion for missing values on distal outcomes; exact *p* values reported.

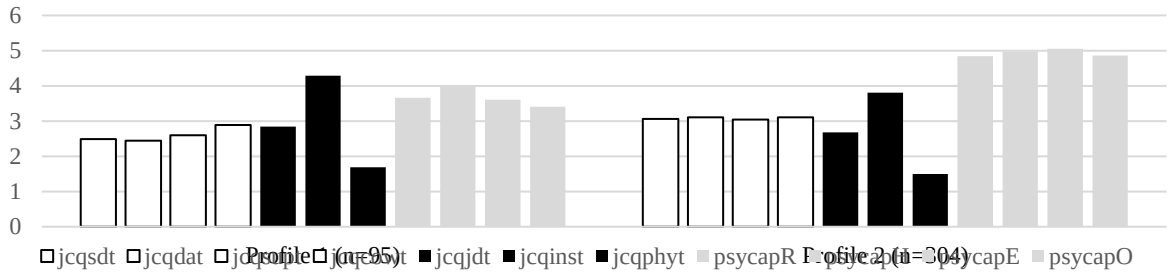

Figure 4.1. Latent profiles (2 subgroups) of absolute scores on job demands, job resources and personal resources. Job demands consist of psychological (JCQjd) and physical (JCQphy) demands as well as job insecurity (JCQins) subscales; job resources consist of skill discretion (JCQsd), decision authority (JCQda), supervisor (JCQsup) and co-worker support (JCQcow) subscales; and personal resources consist of resilience (psycapR), hope (psycapH), efficacy (psycapE) and optimism (psycapO) dimensions. *Note.* White bars = job resources, black bars = job demands, grey bars = personal resources.

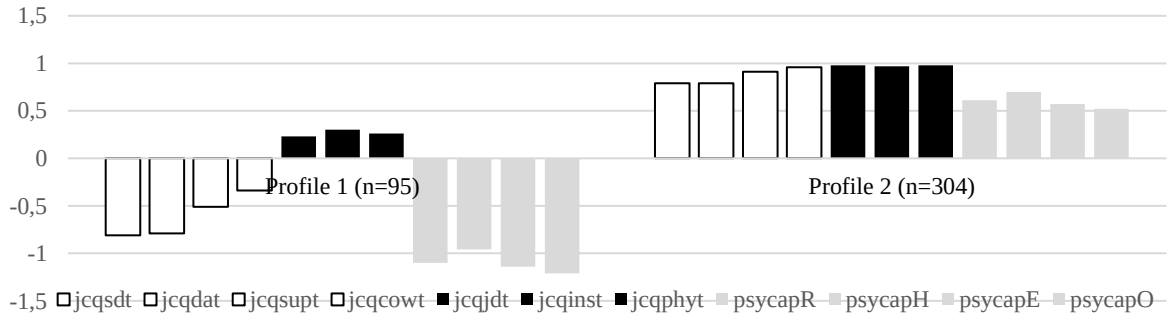

Figure 4.2. Latent profiles (2 subgroups) of standardised scores on job demands, job resources and personal resources. Job demands consist of psychological (JCQjd) and physical (JCQphy) demands as well as job insecurity (JCQins) subscales; job resources consist of skill discretion (JCQsd), decision authority (JCQda), supervisor (JCQsup) and co-worker support (JCQcow) subscales; and personal resources consist of resilience (psycapR), hope (psycapH), efficacy (psycapE) and optimism (psycapO) dimensions. *Note.* White bars = job resources, black bars = job demands, grey bars = personal resources.

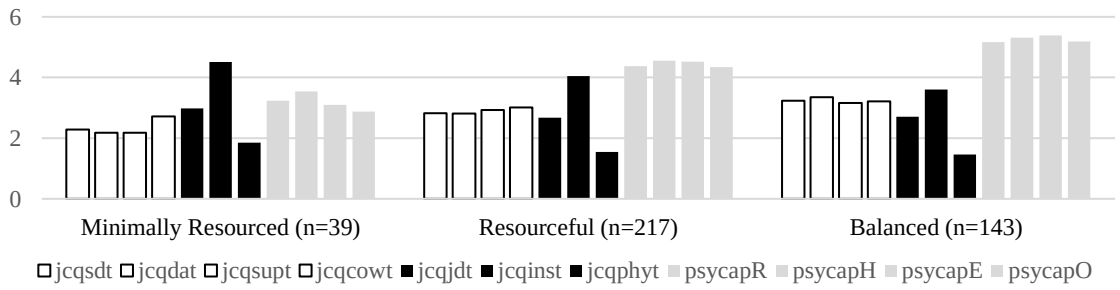

Figure 4.3. Latent profiles (3 subgroups) of absolute scores on job demands, job resources and personal resources. Job demands consist of psychological (JCQjd) and physical (JCQphy) demands as well as job insecurity (JCQins) subscales; job resources consist of skill discretion (JCQsd), decision authority (JCQda), supervisor (JCQsup) and co-worker support (JCQcow) subscales; and personal resources consist of resilience (psycapR), hope (psycapH), efficacy (psycapE) and optimism

(psycapO) dimensions. *Note.* White bars = job resources, black bars = job demands, grey bars = personal resources.

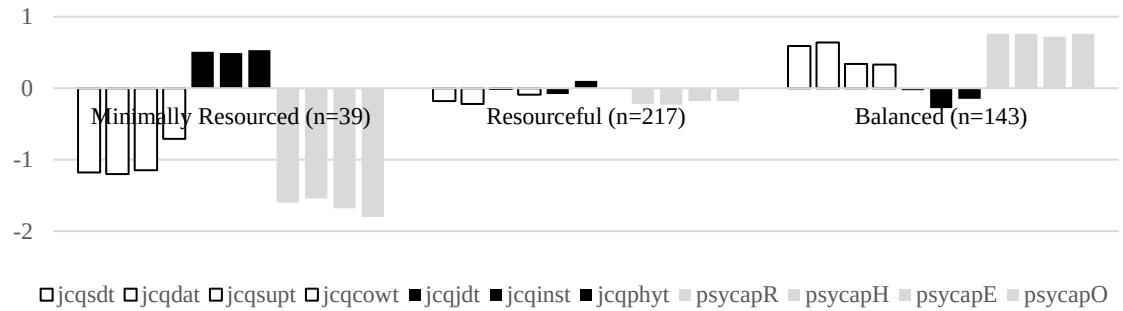

Figure 4.4. Latent profiles (3 subgroups) of standardised scores on job demands, job resources and personal resources. Job demands consist of psychological (JCQjd) and physical (JCQphy) demands as well as job insecurity (JCQins) subscales; job resources consist of skill discretion (JCQsd), decision authority (JCQda), supervisor (JCQsup) and co-worker support (JCQcow) subscales; and personal resources consist of resilience (psycapR), hope (psycapH), efficacy (psycapE) and optimism (psycapO) dimensions. *Note.* White bars = job resources, black bars = job demands, grey bars = personal resources.

Discussion

Using JD-R as a guiding framework, the aim of this study was to identify typologies of demands and resources, and explore differences on burnout, work engagement and health behaviours, using a person-centred approach. The results of the study revealed that distinct typologies of employees can be identified based on a combination of job demands and (job and personal) resources. Specifically, three profiles were identified (i.e., 'minimally resourced', 'balanced' and 'resourceful'). However, the results revealed that differences were largely in degree (quantitative) rather than in kind (qualitative) between these profiles, thus partially supporting H1. The profiles identified in this study are comparable to the employee taxonomy identified by Salanova and colleagues (2014) in their cross-sectional study. Salanova and colleagues identified typologies of employee well-being in a sample of full-time employees from a range of occupational sectors. Consistent with previous findings, the authors identified three (known) taxonomies of employees (engaged, workaholics, and burned-out) in addition to the '9-to-5' taxonomy which has received less attention in the literature. Two of these four employee taxonomies are comparable to two of the employee profiles identified in the present study, namely, minimally resourced (burned-out), and balanced (9-to-5). Similarly to minimally resourced profile members, burned-out employees reported the highest job demands

(routine), lowest job resources (organisational quality) and lowest personal resources (emotional competence). The new taxonomy identified by Salanova and colleagues (2014) '9-to-5', was somewhat similar to the balanced profile in that 9-to-5 employees perceived greater job demands (workload) than workaholics and similar job resources (mental competence) and overall lacking drive. Finally, engaged employees identified in the taxonomy were similar to resourceful profile members in the present study exhibiting the lowest job demands (role ambiguity), high levels of job resources (job control) alongside high levels of personal resources (mental competencies).

It is important when employing person-centred analysis to compare the identified typologies on variables on which they are conceptually likely to be distinguished. According to the health impairment process stipulated within JD-R, experiencing relatively high levels of job demands in the absence of sufficient resources is likely to result in burnout and subsequent health problems. In contrast, the presence of high levels resources, particularly when accompanied by relatively high levels of job demands, will stimulate work engagement (Bakker et al., 2007). The results of the present study revealed that the minimally resourced cluster members displayed the highest burnout and the lowest work engagement scores compared to the other two groups. Minimally resourced profile members' burnout scores are similar to one of three profiles identified by a previous multi-study employing a person-centered approach (P2 characterised by high stressors and low resources; Keller et al., 2016). Keller and colleagues (2016) P2 members (characterised by moderate stressors and moderate resources) are comparable to minimally resourced profile members both in terms of low prevalence in the population (P2 was identified only in one of four studies), and in terms of membership (n = 598) relative to the study sample (representing approximately 20 percent of the sample). In terms of engagement scores, Keller and colleagues (2016) report that P2 members reported lower levels of work well-being (operationalised as job satisfaction and job performance) than P1 members (characterised by high stressors and low resources), corresponding to minimally resourced profile members reporting lower engagement compared to balanced profile members in the present study. This provides support for the validity of the cluster solution, and therefore also for H2 in regards to burnout and work engagement. The fact that the resourceful profile also displayed lower

levels of burnout and the highest levels of work engagement than the balanced profile suggests that personal resources may play a particularly prudent role in the protection against burnout and in the promotion of work engagement, given noteworthy differences between these profiles on self-efficacy, optimism, hope and resilience.

Profiles were also compared on the range of health behaviours assessed in the present study. Overall, the results suggested that participants who reported the greatest levels of well-being tended to engage in a more favourable pattern of health behaviours with some exceptions. Specifically, resourceful and balanced profile members engaged in greater levels of moderate intensity physical activity, slept better (longer duration and better quality) and smoked less (resourceful group only) than employees in the minimally resourced profile. In regards to physical activity, the results partly confirm findings of Stults-Kolehmainen and Sinha (2014) that the presence of stress (broadly defined) may act as a deterrent to physical activity as well as Gerber, Jonsdottir, Lindwall, and Ahlborg Jr's (2014) findings showing that physical activity was characteristic of healthy and resilient profiles in the working population. Additionally, Alexandrova-Karamanova and colleagues (2016) reported that burnout scores were positively associated with health-impairing behaviours, one of which was infrequent exercise. However, it was interesting to note the differences on vigorous physical activity (e.g., balanced employees engaged in lower levels of vigorous physical activity compared to resourceful profile members) as well as walking between the profiles (i.e., resourceful profile members reported walking as opposed to members of the other two profiles). The lack of differences between the profiles on walking may be partly explained by differences between the groups in other types of moderate intensity activities (keeping in mind that walking is also considered a moderate intensity physical activity). Differences in vigorous intensity physical activity approached significance with groups differing in this outcome in the expected direction. Causality cannot be inferred on the basis of this study. The results may suggest that a favourable well-being profile fosters frequent participation in moderate intensity physical activities, whereas the presence of less favourable wellbeing acts as a deterrent to this form of physical activity in particular. Alternatively, the results could suggest that it may be beneficial for individuals' well-being to engage in moderate intensity

activity such as bicycling with low intensity or playing tennis doubles (or other activities different to walking). Data from epidemiologic studies has shown that moderate intensity physical activities (> 4.5 METs) (equivalent to activities such as cutting the grass, brisk walking, or cleaning heavy) may confer a greater protective effect for individual well-being when compared to activities of lower intensity (e.g., Lee, 2003). Experimental studies and results of interventions have shown that increases in moderate intensity physical activity can improve psychological well-being, mental health and other health outcomes (e.g., musculoskeletal pain symptoms) in addition to having an effect on work-related (e.g., self-reported work performance) and personal outcomes (e.g., long-term income; Coulson, McKenna, & Field, 2008; Freak-Poli, Wolfe, Wong, & Peeters, 2014; Hyytinen & Lahtonen, 2013; Kim, Kubzansky, Soo, & Boehm, 2017; Pedersen et al., 2009; White et al., 2017).

With regards to sleep, the study results were in line with the findings of previous studies (employing variable-centred approaches) showing links between sleep, and decreased work engagement and burnout (Barber, Grawitch, & Munz, 2013; De Beer, Pienaar, & Rothmann Jr, 2014; Ekstedt, Söderström, & Akerstedt, 2009; Peterson et al., 2008). Resourceful profile members reported higher levels of sleep duration and quality than balanced and minimally resourced profile members and in turn, balanced profile members reported higher levels compared to minimally resourced profile members. Taken together with the profile differences identified on burnout and engagement, the results are consistent with past evidence showing poor sleep duration and quality are associated with lower work engagement levels and burnout (e.g., Barber et al., 2013; De Beer et al., 2014). It is suggested from the literature that sleep behaviour is crucial to employee health (Hublin, Partinen, Koskenvuo, & Kaprio, 2007; Kemple, O'Toole, & O'Toole, 2016; Liu, Wheaton, Chapman, & Croft, 2013; Price, 2016), and that good sleep quality protects against a number of chronic illnesses including obstructive sleep apnoea and cardiovascular mortality (Campos-Rodriguez et al., 2012; Ratnavadivel et al., 2009). Further, cross-sectional evidence shows that good sleep quality is strongly associated with employee self-rated health and work-related outcomes such as productivity (Bolge et al., 2009; Dean et al., 2010; Ghalichi, Pournik, Ghaffari, & Vingard, 2013) and decreased presenteeism (Guertler et al., 2015).

Resourceful and balanced profile members also demonstrated a healthier behaviour profile regarding smoking compared to participants in the minimally resourced group, thus supporting H2. A large prospective study (N = 166,130) has found that smokers who report relatively high levels of job strain (present in our minimally resourced profile) smoke more frequently than smokers without job strain (Heikkilä et al., 2012). However, in interpreting the results relating to this health behaviour, it should be noted that prevalence of smoking was relatively low in the current study (8.80%).

The most unexpected finding from the present study was in regards to differences in the reported consumption of fruits and vegetables. Specifically, while minimally resourced profile members reported lower fruit consumption compared to balanced and resourceful profile members, they also reported higher vegetable consumption than balanced and resourceful profile members. There are a few possibilities that could explain these findings. First, the differences observed in FVC among profile members may be due to their respective characteristics on job demands and resources. Decreased levels of fruit consumption in minimally resourced profile members (when compared to the other profile members), who were characterised by having high job demands, is a finding consistent with past evidence (e.g., Mouchacca et al., 2013). Low levels of fruit consumption may be explained by greater time constraints experienced by minimally resourced profile members (i.e., being busy at work allows less time for healthy behaviours; Payne, Jones, & Harris, 2012). Past cross-sectional research (N = 1,013) investigating correlates of FVC among two types of labour workers (construction labourers and motor freight workers) suggest that different work experiences may be related to FVC in different ways (e.g., lack of time has been associated with lower FVC in motor freight workers; Nagler et al., 2013). Second, the differences in FVC may also be attributable to the accessibility of fruits and vegetables in (or around) the workplace. Research (N = 528) examining the impact of free provision of fresh fruits and vegetables at worksites revealed a significant increase in employees' FVC (Backman et al., 2011). In the context of the present study, though resourceful profile members reported the highest levels of fruit consumption, it is likely that they reported the lower vegetable consumption due to lack of time, or accessibility, if fruits were more easily accessible than vegetables.

Third, factors related both to the working environment (e.g., social norms at work) but also outside of work such as individual (e.g., education level, income) or contextual factors (e.g., food availability or sufficiency in the household) associated with fruit and vegetable consumption could also help explain these findings. In the present study however, only education level was considered among these factors. For example, two intervention studies (N = 2,928) targeting risky health behaviours in working-class employees across two organisations in the USA revealed that an increase in FVC is strongly positively associated with contextual factors (social networks and supportive social norms) and food sufficiency, and negatively associated with financial strain (Sorensen et al., 2007). Moreover, past research findings have revealed disparities in FVC by occupation (i.e., white-collar workers report higher FVC than blue-collar workers; Heimendinger et al., 1995) and by education level and income (i.e., higher education level and income is associated with higher FVC; Serdula et al., 2004). It should be noted that the minimally resourced profile members included only 37 participants, and as such, the higher consumption of vegetables in this sample could be due to chance. A larger sample might have produced different results.

It is apparent from the findings that the within-person associations between employee health behaviours and work factors are complex. Although the findings related to alcohol consumption did not support the second hypothesis (i.e., minimally resourced profile members did not report the highest consumption of alcohol), it could be argued that the results pertaining to alcohol consumption were not unexpected. In the present study, balanced profile members reported higher alcohol consumption than the other two profiles even though these profile members reported lower demands and higher resources than the minimally resourced profile members. This finding could be explained by the hypothesis that health behaviours moderate the perceptions of the effect of excessive job demands on burnout (Study 1, p. 21). Reporting the highest demands and lowest resources, minimally resourced profile members may engage in less harmful (or risky) behaviours to cope – and protect themselves from – burnout and exhaustion. Past research has suggested that certain health behaviours may be used by individuals to counteract the negative effects of burnout (or exhaustion), as a result of increased job demands (Payne et al., 2012). Resourceful profile members reported lower levels of

alcohol consumption alongside average levels of job demands and moderate-to-large amounts of resources (conducive for work engagement as per JD-R theory). Previous research has shown that the relation between alcohol consumption and cardiovascular disease (Reynolds et al., 2003; Wulsin et al., 2003), as well as cardiovascular mortality (Di Castelnuovo et al., 2006; Ronksley et al., 2011), resembles a 'j-shape', indicating that light and moderate alcohol consumption is associated with lower mortality and cardiovascular disease as opposed to high alcohol consumption (which is associated with higher mortality and cardiovascular disease; Rostron, 2012).

Empirical and Practical Implications of Study Findings

The findings of the present study may have implications for both theory and practice. The results highlight the importance of considering the inclusion of health behaviours in future research employing the JD-R model (e.g., Brauchli et al., 2015). The study results suggest that engagement in healthy behaviours (e.g., moderate physical activity, sufficient sleep quality and duration) may protect against the negative effects of burnout (stemming from increased job demands and low job resources), and that moderate job demands and sufficient job resources are associated with a more adaptive health behaviour profile in employees. It will be important in future research to examine the specific role(s) that each of the health behaviours may play within the JD-R model. In particular, the roles of FVC and alcohol consumption should be further examined, as well as the context-specific factors that influence these health behaviours. The results of this study yielded varying levels of engagement in these health behaviours by profile members characterised by both favourable and unfavourable levels of demands and resources. Moreover, the exact role of personal resources in the development of work-related well-being should also be examined. Past cross-sectional research has found support for the integration of personal resources in the JD-R model in specific occupational groups (e.g., veterinary professionals; Mastenbroek et al., 2011), whereas other cross-sectional evidence has shown that personal resources (emotional stability) alongside organisational support are significant predictors of work-related well-being (Soh, Zarola, Palaiou, & Furnham, 2016). Employee personal resources can be increased via interventions involving exercises (e.g., accepting the past, appreciating the present, and looking at the future as a source of opportunities) designed to increase their levels of

psychological capital (hope, optimism, self-efficacy and resilience; Van Wingerden, Bakker, & Derks, 2015).

Study Strengths and Limitations

This study represents one of few studies which have examined typologies based on job demands and resources using a person-centred approach, and is the first study to show how such profiles differ on a range of health related behaviours. The present study has a number of strengths. First, the study employed a person-centred approach (i.e., LPA) allowing for identification of distinct typologies of individuals as opposed to a variable-centred approach that has been adopted to study these associations to date. Second, the present study examined a range of employee health behaviours as opposed to one or two health behaviours that have typically been studied within the context of job demands and resources (e.g., Katz et al., 2014; LeCheminant et al., 2015). Third, new knowledge was generated from the results of the study showing distinct typologies of employees based on a combination of job demands and (job and personal) resources. The current understanding on this topic is that employee engagement in positive health behaviours is associated with work-related well-being (work engagement), and engagement in negative health behaviours is associated with negative organisational outcomes (burnout). The results of the present study show that besides the profile differences of demands and resources, all three profile members ('minimally resourced', 'balanced' and 'resourceful') engaged in both positive and negative health behaviours at different levels while indicating a positive health behaviours/work engagement and negative health behaviours/burnout tendency (i.e., favourable demands and resources suggested a more adaptive employee health profile and vice versa). This contrasts with the current assumption that employee engagement is associated only with positive health behaviours and work-related well-being (work engagement), whereas engagement in negative health behaviours is associated with negative organisational outcomes (burnout). Notwithstanding these strengths, limitations are important to consider in the interpretation of the results. First, the cross-sectional design employed in the present study precludes inferences about causality. Self-reported measures were used to assess the behavioural variables in this study which may introduce problems with common method variance (Donaldson & Grant-Vallone, 2002;

Lindell & Whitney, 2001). Second, there are other known limitations associated with the use of self-reported measures of behaviour pertaining to cognitive biases (e.g., ordinal nature of subjective measures makes changes in variables of interest difficult to detect; Jahedi & Méndez, 2014). It will be important in future research to employ objective measures of health behaviour. For example, physical activity, sedentary behaviour and sleep can be assessed via accelerometry devices. Further restrospective assessments of well-being and behaviours were collected, which are associated with memory bias. Future research should consider adopting alternative study designs such as diary methodologies in which well-being and behaviours are assessed in real-time, or at the daily level. Third, the sample was generally well-functioning, with most participants belonging to the 'balanced' or 'resourceful' profiles. This may reflect self-selection bias and therefore undermine the external validity of the study, albeit this is common in psychological research (Bethlehem, 2010; Lash, Fox, & Fink, 2009).

Conclusion

The results of the present study provide evidence for three distinct employee profiles based on a combination of job demands, and job and personal resources. The quantitative differences identified among the profiles support past research in terms of job demands and resources only and extend previous research by integrating personal resources. Moreover, a range of employee health behaviours were considered in this study. A comparison of the profiles on a range of health behaviours suggested that while employees across all profiles engage in a mix of favourable (positive) and unfavourable (negative) health behaviours, employees reporting high levels of well-being tended to engage in more favourable health behaviours with some exceptions. Future research should be conducted to further explore the specific role(s) of each health behaviour within the JD-R model, as well as the role of personal resources in the development of work-related well-being using alternative study designs and a larger sample.

Chapter III Summary

Considering the relevance of job demands-resources (JD-R) model processes to health outcomes, the exclusion of health behaviours in the model is an important omission from the

literature. The few available studies that have investigated employee health behaviours vis-à-vis JD-R model constructs have typically examined isolated health behaviours. However, individuals do not engage in health behaviours in isolation, but simultaneously. Further, the majority of these studies have employed variable-centered approaches (e.g., regression analysis). This approach assumes that all variables relate to each other in the same way, though this may not always be the case. I employed a person-centered approach to identify job demands-resources typologies of employees and examine their differences on health behaviours and workplace constructs covered by the JD-R model (burnout, engagement). The results revealed three typologies of employees ('balanced', 'resourceful' and 'minimally resourced') reporting salient differences on health behaviours and burnout/engagement. The findings of this study indicate engagement in health-enhancing behaviours may protect against the negative effects of burnout, and that moderate job demands and sufficient job resources are associated with a more adaptive health behaviour profile in employees. The cross-sectional survey design adopted in this study was subject to limitations such as recall bias (Sedgwick, 2014), known to be prevalent when adopting self-report measures of health behaviours (e.g., physical activity; Sylvia, Bernstein, Hubbard, Keating, & Anderson, 2014). The use of device-based measures to assess health behaviours (e.g., sedentary behaviour; Urda, Larouere, Verba, & Lynn, 2017) would strengthen the conclusions that can be drawn. Furthermore, employee well-being has been shown to vary from day-to-day necessitating the need for alternative study designs (e.g., daily diary design; Butler, Grzywacz, Bass, & Linney, 2005). A daily diary design is expected to enable investigation of the day-to-day context and allow to explore the positioning of health behaviours in relation to the JD-R framework.

CHAPTER IV: EXAMINING TEMPORAL ASSOCIATIONS BETWEEN HEALTH BEHAVIOURS AND JD-R MODEL CONSTRUCTS: A DAILY DIARY STUDY

Introduction

Working adults in the western world spend a significant amount of time at work (Australian Bureau of Statistics, 2010) making the workplace an important context in which to examine factors that may impair or enhance the health and well-being of individuals. Employee health is considered an important factor for organisations both in terms of costs (e.g., health care costs associated with ill health) and in terms of value production (i.e., employee productivity), thereby justifying the focus of many organisational strategies to create healthy and productive workforces in recent years (Kirsten, 2010; World Health Organization, 2013). Non-health care costs incurred by organisations associated with health risk factors (e.g., obesity, tobacco use) include decreased productivity attributable to absenteeism (missed work due to health issues) and presenteeism (on-the-job decreased productivity due to ill health; Alker, Wang, Pbert, Thorsen, & Lemon, 2015). Suffice it to say, employee health is an important consideration for organisations.

Health behaviours are known to be key determinants of employee health (e.g., Conner & Norman, 2017; Saint Onge & Krueger, 2017; Yang, Yang, Zhu, & Qiu, 2011). Health behaviours refer to activities that can be seen (e.g., running, eating fruits and vegetables) or heard (e.g., discussing necessary lifestyle-related changes with a doctor) by an observer that may positively or negatively influence health (World Health Organisation, 1998, p. 8). Engaging in health-enhancing (e.g., frequent physical activity, restful sleep) or avoiding health-impairing (e.g., excessive alcohol consumption, tobacco use) behaviours is critical for maintaining optimal physical health and psychological well-being (Schneider & Schneider, 2012). Considering the workplace has been identified as an ideal setting for influencing individual health behaviours (Kuoppala, Lamminpaa, & Husman, 2008), health behaviours should also be examined vis-a-vis individual resources (e.g., social or personal resources) and the psychosocial working environment (e.g., job resources) as determinants of workplace well-being (Justesen, Eskerod, Christensen, & Sjøgaard, 2017). Characteristics of the job role (e.g., physical or mental/emotional labour, day or night shifts, etc.) and the psychosocial work

environment (e.g., working overtime, relationships with colleagues and supervisors, etc.) are important considerations as they have been shown to influence a variety of health outcomes for individuals (e.g., Ishizaki et al., 2004). Health outcomes are defined as indices of health status, wholly or in-part due to an intervention (Nancarrow, 2013). Burnout, for example, which is characterised by chronic exhaustion, a negative attitude toward the job and reduced professional efficacy (Maslach, Schaufeli, & Leiter, 2001), has been associated with a number of physical health problems including type 2 diabetes, lipid metabolism disorder, cardiovascular complications and an increased risk for regional musculoskeletal pain (Melamed, 2009; Melamed, Shirom, Toker, Berliner, & Shapira, 2006; Penz et al., 2018; Toppinen-Tanner et al., 2009). On the contrary, work engagement, defined as a state of fulfilment and energetic connection with one's work, characterised by vigour, dedication and absorption (Schaufeli, Salanova, González-Romá, & Bakker, 2002, p. 74), is regarded to be favourable for employees (e.g., engaged employees are reportedly enthusiastic about their job and report high levels of energy; Macey & Schneider, 2008). Evidence vis-à-vis health outcomes suggests work engagement is associated with favourable employee physical (e.g., high levels of self-reported health; Bakken & Torp, 2012; Rongen, Robroek, Schaufeli, & Burdorf, 2014) and mental health (e.g., increased self-reported general mental health; Leijten et al., 2015), as well as quality of life (i.e., job and family satisfaction; Shimanzu, Schaufeli, Kamiyama, & Kawakami, 2015). A popular theoretical framework of employee well-being that encompasses constructs of the psychosocial work environment is the job demands-resources (JD-R) model (Bakker & Demerouti, 2007; Demerouti & Bakker, 2011; Demerouti et al., 2001a, 2001b).

The JD-R model is based on five propositions. The first proposition is that all job characteristics can be modelled in two categories – job demands and job resources – making the JD-R appropriate for virtually any occupation. Job demands are defined as those aspects of the job (physical, psychological, social and/or organisational) requiring effort and being associated with physical and/or psychological costs (e.g., physical job demands or emotionally taxing interactions with customers; Bakker & Demerouti, 2016). Job resources are defined as those aspects of the job (physical, psychological, social and/or organisational) that are conducive to achieving work goals,

decrease job demands and stimulate learning and development (e.g., supervisor feedback or job autonomy; Bakker, 2011). The second JD-R proposition is that job demands and resources trigger two separate processes; the health impairment and the motivational process leading to burnout and work engagement, respectively. Research over the years has supported this dual process across a range of occupations (e.g., Bakker, Demerouti, De Boer, & Schaufeli, 2003; Bakker, Demerouti, & Verbeke, 2004; Hakanen, Schaufeli, & Ahola, 2008). The third proposition is that job demands and job resources interact, such that job resources can buffer the negative effects of job demands on strain. A number of cross-sectional studies have provided evidence for this interaction effect (e.g., Bakker, Demerouti, & Euwema, 2005; Xanthopoulou et al., 2007b; Bakker, Van Veldhoven, & Xanthopoulou, 2010). The fourth proposition is that job resources particularly influence motivation when job demands are high, which is based on the assumption that resources acquire motivating potential and become useful when necessary (e.g., when time pressure is high; Hobfoll, 2001). Evidence for the usefulness and motivating role of job resources when job demands are high was found in two studies with dentists and teachers in Finland (N = 2,724; Bakker, Hakanen, Demerouti, & Xanthopoulou, 2007; Hakanen, Bakker, & Demerouti, 2005). The fifth proposition is that personal resources (e.g., self-efficacy, optimism) are similar to job resources in that they buffer the negative effects of demands on strain. Personal resources have been defined as "beliefs that people hold regarding how much control they have over their environment" (Bakker & Demerouti, 2016, p. 3). Some support has been provided for the assumptions that personal resources have a direct positive effect on work engagement, and that personal resources can buffer the negative impact of increased job demands on strain while boosting the positive impact of (challenge) job demands on motivation (e.g., Bakker & Sanz-Vergel, 2013; Xanthopoulou, Bakker, & Fischbach, 2013).

There is considerable evidence supporting JD-R model constructs in relation to employee health outcomes, yet there is limited research available on associations between JD-R model constructs and employee health behaviours. This exclusion is important as health behaviours strongly predict individual health outcomes. Sedentary behaviour for instance (i.e., sitting, lying or reclining resulting in energy exposure below 1.5 METs; Tremblay et al., 2017), is prevalent among office

workers, forming part of the job role, and has been associated with musculoskeletal disorders, cardiovascular disease and non-communicable diseases such as obesity and type 2 diabetes (Chau, Van Der Ploeg, Dunn, Kurko, & Bauman, 2011; Choi et al., 2010; Straker, Coenen, Dunstan, Gilson, & Healy, 2016). Certain health behaviours have also been shown to be associated with aspects of the psychosocial work environment (i.e., job demands and resources; Niedhammer & Chea, 2003). For example, a large cross-sectional study of North American office workers (N = 6,995) revealed associations between tobacco consumption and high job strain (i.e., high job demands/high job resources), and sedentary behaviour and both high and moderate (i.e., low job resources) levels of strain (Brisson, Larocque, Moisan, Vézina, & Dagenais, 2000). Evidence from more recent studies suggests that other health-impairing behaviours such as short sleep duration (e.g., Barber, Grawitch, & Munz, 2013) and hazardous alcohol consumption (e.g., Ahola et al., 2012) are associated with heightened burnout levels. This evidence demonstrates the limited available research and understanding of how health behaviours are associated with JD-R processes.

Conceptual and methodological limitations of past work shed light on several important avenues for future research. First, the majority of the aforementioned studies have been atheoretical. It is important that studies are based on a theoretical framework in order to understand the process and mechanisms by which the variables are associated. Second, the majority of available studies in occupational health psychology have adopted cross-sectional survey designs, with no consideration of the temporal and dynamic associations between the variables (see chapter II for a detailed review). The use of a daily diary design (e.g., Dormann & Van De Ven, 2014; Simbula, 2010; Yeo & Neal, 2004; Zakerian & Subramaniam, 2009) is appropriate to examine dynamic associations (Ohly, Sonnentag, Niessen, & Zapf, 2010). Diary designs allow researchers to assess and explore fluctuations in employee experiences and reactions to work by collecting data at multiple time points (e.g., recording assessments daily, or multiple times per day, over a number of days) and do not limit researchers to data collected at a single time point (e.g., collecting a single retrospective assessment over a number of weeks or months). Employees' reactions to work, well-being and performance fluctuate on a daily basis (Butler, Grzywacz, Bass, & Linney, 2005), and in comparison to cross-

sectional studies, diary designs reduce the likelihood of retrospective bias as the lag between events and data collected is significantly shorter (Reis & Gable, 2000). Furthermore, diary designs allow researchers to take into account the situational and day-to-day context (i.e. natural context) of respondents when studying cognitive states, feelings and behaviour beyond the general perspective typically examined by cross-sectional and longitudinal research (Demerouti & Bakker, 2011; Reis & Gable, 2000). Third, the majority of available studies to date have adopted self-report measures of health behaviours (e.g., Katz, Pronk, & Lowry, 2014; LeCheminant et al., 2015) in spite of known limitations associated with their use (e.g., cognitive biases, demand characteristics; Haeffel & Howard, 2010). Wearable device-based data (e.g., data obtained using an accelerometer) is an alternative to self-reported behaviour. A number of studies have shown that across populations, widely used self-report tools (e.g., International Physical Activity Questionnaire; Craig et al., 2003) for measuring health behaviours (e.g., physical activity, sedentary time) often lead to inaccurate estimates (i.e., over-reporting and/or under-reporting; Celis-Morales et al., 2012; Kavanaugh, Moore, Hibbett, & Kaczynski, 2015; Liu, Eaton, Driban, McAlindon, & Lapane, 2016). Fourth, studies to date have typically examined one or two employee health behaviours only vis-à-vis constructs of the JD-R model. The focus on one or two behaviours is an important limitation as individuals engage in multiple health behaviours concurrently rather than in isolation. Some of the most widely studied behaviours in health psychology include physical activity (e.g., Cameron, Bertenshaw, & Sheeran, 2018), diet (e.g., fruit and vegetable consumption; Elbert, Dijkstra, & Rozema, 2017), and tobacco (e.g., De Graaf et al., 2017) and alcohol consumption (e.g., hazardous consumption; Lynch, Coley, Sims, Lombardi, & Mahalik, 2015). More recently, sleep (e.g., Irwin, 2015) and sedentary behaviour (e.g., De Rezende, Rodrigues Lopes, Rey-López, Matsudo, & Do Carmo, 2014) have been the focus of studies in the field highlighting their emerging importance.

In the present study, I employ a daily diary design to test two distinct models summarising the possible ways by which employee health behaviours could be related to JD-R model constructs. The first proposed model (see Model 1) suggests that health behaviours are distal outcomes of JD-R processes. This perspective is largely implicit through the available literature. Health behaviours have

not typically been the focus of studies examining associations between employee health and the psychosocial work environment (as opposed to mental health, e.g., Stansfeld & Candy, 2006) and they have not been central to the JD-R model. Instead, the health-impairment process of the JD-R model interprets strain on the individual as an imbalance between (job and personal) demands and resources that ultimately leads to burnout. The literature has mainly investigated strain (e.g., repetitive strain; Bakker, Demerouti, & Schaufeli, 2010) and burnout (e.g., Shirom, 2010) as predictors of negative health outcomes including ill health (e.g., presenteeism; McGregor, Magee, Caputi, & Iverson, 2016) and chronic disease (e.g., coronary heart disease; Toker, Melamed, Berliner, Zeltser, & Shapira, 2012). A few studies form the exception to this rule, showing burnout may predict changes in certain health behaviours such as sleep (e.g., reduced sleep quality) and diet (e.g., increased food consumption). For example, Nevanperä and colleagues (2012) conducted a randomised control trial (N = 230) in Finland to investigate associations between burnout, eating behaviour and other health indicators among female employees. In regards to dietary changes, the results showed that burnout predicted eating behaviour. Participants reporting high levels of burnout also scored significantly higher on emotional eating, suggesting such eating styles may be a passive way of coping with stress. Another study among female employees in Sweden, examined physiological (i.e., immune, endocrine, and metabolic) correlates of burnout among women (N = 164) showing that employees exhibiting high burnout scores also reported high sleep impairments (i.e., reduced sleep quality and sleep disturbances) alongside other negative physiological outcomes (e.g., enhanced inflammatory responses; Grossi, Perski, Evengård, Blomkvist, & Orth-Gomér, 2003). Similar to burnout, few studies are available investigating work engagement in relation to individual health behaviours. The majority of research has focused on situational (e.g., job resources) and personal factors (e.g., personal resources) as predictors of work engagement (e.g., Bakker, 2014). For instance, a recent cross-sectional study investigating associations between sedentary behaviour and work engagement in a large sample of Irish office workers (N = 4,436) showed an inverse relation between work engagement and sedentary behaviour beyond health behaviours, demographic and work characteristics (e.g., working hours; Munir et al., 2015). Similar findings were revealed by another cross-sectional study investigating a number of health-enhancing behaviours (i.e., dietary intake of

fish, regular exercise, sufficient sleep, tobacco abstinence) in relation to work engagement in a sample of Japanese employed adults (N = 797). The results showed support for positive associations between these health-enhancing behaviours and work engagement even after adjusting for demographic characteristics and symptoms of depression and anxiety (Nishi, Suzuki, Nishida, Mishima, & Yamanouchi, 2017). Clearly, the evidence is limited, but the available findings suggest that health behaviours might represent distal outcomes of the health impairment and the motivational processes of the JD-R.

Model 1: Health behaviour as distal outcome of JD-R

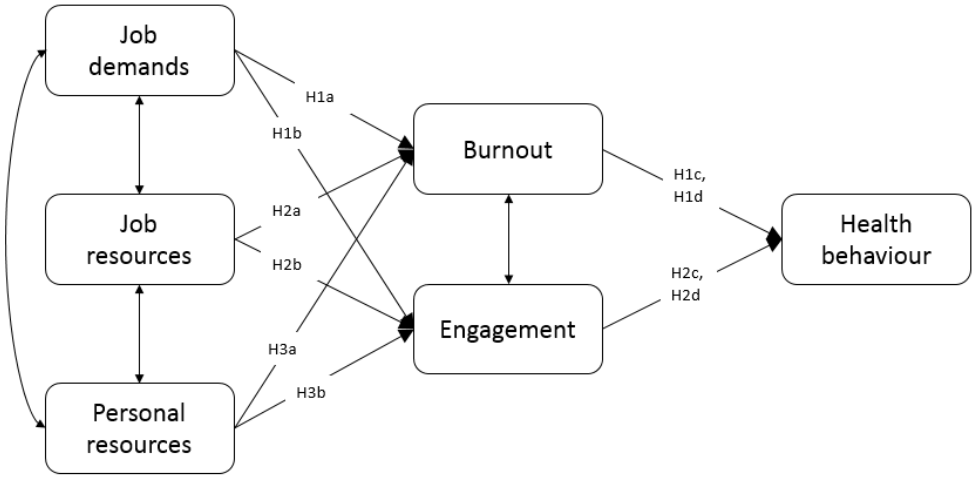

Figure 5.1. Model 1 testing health behaviour as a distal outcome of JD-R processes (demands, resources, burnout and engagement).

The second proposed model (see Model 2) suggests that health behaviours are proximal outcomes of demands and resources. Some research supports this assertion for employees in sedentary occupations. Increased job demands (and/or decreased job resources) are likely to facilitate engagement in health-impairing behaviours (e.g., decreased physical activity levels; McCarthy, Wills, & Crowley, 2018), whereas decreased levels of job demands and sufficient (or increased) levels of job

resources are likely to promote engagement in health-enhancing behaviours (e.g., decreased risk of disturbed sleep; Nordin, Westerholm, Alfredson, & Åkerstedt, 2012). With regards to health-impairing behaviours, at least four studies have shown that increased job demands (e.g., work overload, role conflict) are associated with health-impairing behaviours including low physical activity levels (Kirk and Rhodes, 2012; McCarthy et al., 2018) and poor sleep quality (Åkerstedtet al., 2015; Knudsen, Ducharme, & Roman, 2007). Some evidence indicates that low physical activity and poor sleep are also associated with low levels of job resources (e.g., job control; Nordin et al., 2012; Smith, Frank, Mustard, & Bondy, 2008). With regards to health-enhancing behaviours, there is less available research, though some studies indicate support for the proximal outcome conceptualisation of health behaviours. Related research employing a daily diary design suggests that on days when job demands are high, employees' exercise intentions fail to translate into action when compared to days when job demands are lower (Payne, Jones, & Harris, 2010). On the contrary, when job resources (e.g., job control) are sufficient, the evidence outlines a consistent positive effect on physical activity levels (e.g., Bennett et al., 2006; Choi et al., 2010; Fransson et al., 2012). Health behaviours may therefore be conceptualised as behavioural outcomes of job demands (health impairment) and job resources (motivational processes), and burnout and work engagement may be conceptualised as cognitive and affective (emotional) outcomes.

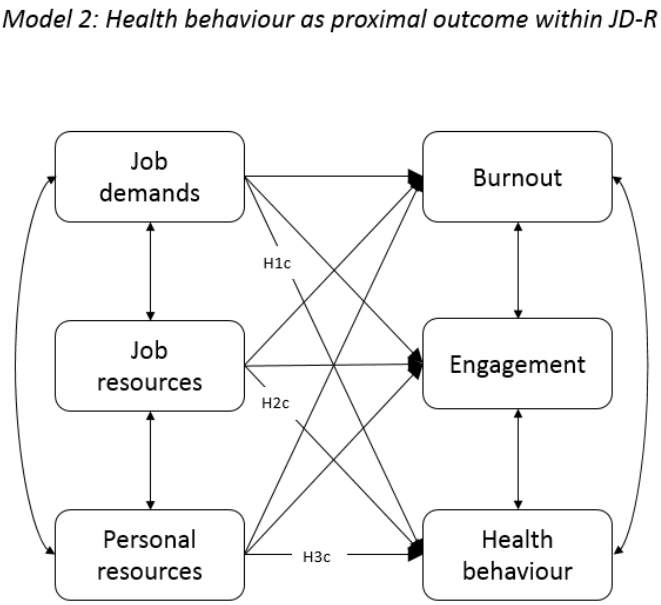

Figure 5.2. Model 2 testing health behaviour as a proximal outcome of JD-R processes (demands, resources, burnout and engagement).

Study Aim and Hypotheses

The overall aim of this study was to examine the positioning of health behaviours within the context of the JD-R framework as distal outcomes of the health impairment and motivational pathways (Model 1; see Figure 5.1) or proximal outcomes of demands and resources (Model 2; see Figure 5.2). To do so, I adopted a daily diary design to disentangle the between- and within-person temporal associations between employee health behaviours and JD-R model constructs (Models 1 and 2 presented above). With regards to model 1, I expect that demands will be positively associated with burnout (H1a) and negatively related with engagement (H1b), whereas resources will be negatively associated with burnout (H2a, H3a) and positively related with engagement (H2b, H3b). In turn, burnout will be positively associated with health-impairing behaviours (H1c) and negatively related with health-enhancing behaviours (H1d). In contrast, engagement will be negatively associated with health-impairing behaviours (H2c) and positively related with health-enhancing behaviours (H2d). I

also expect that demands and resources affect health behaviours indirectly via burnout (H1e) and engagement (H2e). With regards to model 2, I expect that job demands (H1c), job resources (H2c) and personal resources (H3c) will affect health behaviours directly. Specifically, health behaviours considered adaptive for health (e.g., frequent physical activity, low alcohol consumption) will be associated positively with resources and negatively with demands.

Methods

Participants

In total, 71 employees in sedentary occupations were recruited into the study from several organisations based in Western Australia. The inclusion criteria for the study required that participants (i) were at least 18 years of age, (ii) were proficient in English (if English was not their first language), (iii) were currently in part-time or full-time employment, (iv) remained sedentary for the largest part of the workday due to the nature of their work, and (v) lived and worked in Australia. A portion of the sample (40%; $n = 26$) consisted of participants from Study 2 who had indicated they were interested in being contacted for a follow-up study. The remaining data ($n = 45$) were collected from participants who met the study criteria and were employed by other organisations. Of the 71 consenting participants, four individuals dropped out before the end of the 14-day period and two participants completed the study but were excluded as they did not follow the study instructions (i.e., completed the daily survey retrospectively after the 14-day period). Sixty five participants' data were retained for the main analyses. The final sample included 19 male (28%) and 46 female (69%) employees, with an average age of 44 years ($SD = 12.96$). Participant ethnicity, education level and job type is shown in Tables 1, 2 and 3.

Table 1
Frequencies and Percentages of Participant Ethnicity.

	Frequency	Percent
Caucasian	369	80.2
European	41	8.9
Other	23	5
Asian Pacific	16	3.5
Prefer not to disclose	7	1.5
Aboriginal/Torres Strait Islander	2	.4
African	1	.2

Table 2
Frequencies and Percentages of Participant Education Level.

	Frequency	Percent
Bachelors degree	173	37.7
Masters degree	64	13.9
Certificate III/IV	55	12
Advanced diploma/diploma	54	11.8
Graduate diploma/graduate certificate	30	6.5
Upper secondary schooling (no qualification)	29	6.3
Upper secondary schooling (qualification)	25	5.4
Doctoral degree	23	5
Certificate I/II	6	1.3

Table 3
Frequencies and Percentages of Participant Job Type.

	Frequency	Percent
Managers and administrators	210	45.8
Professionals	152	33.1
Intermediate clerical, sales and service workers	29	6.3
Advanced clerical, sales and service workers	24	5.2
Associate professionals	16	3.5
Elementary clerical, sales and service workers	12	2.6
Tradespersons and related workers	7	1.5
Labourers and related workers	6	1.3
Intermediate production and transport workers	3	.7

Measures

Demographics and existing physical or mental health conditions. Information on sex, date of birth, education level, ethnicity (measured as per the Australian Standard Classification of Cultural and Ethnic Groups), and job type (measured as per the Australian and New Zealand Standard

Classification of Occupations) was collected in order to assess participants' demographic characteristics. Two items were included to establish whether any participants were diagnosed with a physical (e.g., diabetes, hypertension, chronic pain) or mental health (e.g., eating disorder, anxiety disorder, bipolar disorder) condition.

Physical activity, sedentary behaviour and sleep. Physical activity, sedentary behaviour and sleep were measured objectively using an accelerometer watch worn 24 hours per day throughout the 14-day study period. The GENEActiv (Activinsights Ltd., Cambridgeshire, UK) is a tri-axial, ±6 g seismic acceleration sensor, which is small (36 cm × 30 cm × 12 cm), lightweight (16 g) and waterproof. The accelerometer watch was worn on participants' non-dominant wrist (Hees et al., 2014; Pavey, Gomersall, Clark, & Brown, 2016). At the end of the daily survey, two items were included to record participant non-wear time, if any ("Did you take off the accelerometer watch at any point today?" and if yes, "How long for?"). Participants were asked to ignore non-wear time that was less than 15 minutes (e.g., non-wear time while showering). In order to determine that non-wear time did not exceed the allocated time, objective daily wear time (GENEActiv) was cross-checked against the corresponding self-reported non-wear item data. Besides objective measurement of sleep duration, questions were also included in the daily survey relating to the time the participants woke up that morning and the time they went to bed. These responses were entered in 24-hour format. Instructional sets for all measures were adapted from the original versions to reflect the daily assessments of participants.

GENEActivs were configured with a sampling frequency of 30 Hz. Downloaded .bin files were converted to 60 s epoch .csv files using PC software version 2.1 (GENEActiv). The csv files were then processed using custom built software (COBRA, University of South Australia). Briefly, the algorithm converts the raw data into clinically relevant outcomes such as sleep/wake measurements, and physical activity levels in terms of acceleration and metabolic equivalent of tasks (MET). Sleep periods (defined manually from graph), thresholds (using recommended cut-off points for middle-aged adults: light=313, moderate=594, vigorous=595) (Dillon et al., 2015a; Dillon et al., 2015b) and bouts (defined automatically by Cobra) were calculated for all participants. After processing GENEActiv raw data, daily light, moderate and vigorous physical activity; daily moderate and

vigorous physical activity; daily sedentary time and daily sleep time were extracted for each participant. Data pertaining to weekdays only was included in the final analyses as their associations with work-related variables were of interest. Week-end wear time was considered in order to determine whether participants met Australia's physical activity and sedentary behaviour guidelines for adults (Australian Government, Department of Health, 2014; 150 minutes of moderate intensity or 75 minutes of vigorous intensity physical activity each week).

Fruit and vegetable consumption. Fruit and vegetable consumption was assessed using two self-report items (one for fruit and one for vegetable consumption; adapted to the day-level from Katz et al., 2014). Participants were asked to record the number of fruit and vegetable servings they consumed each day ("How many servings of fruit did you consume today?" and "How many servings of vegetables did you consume today?"). Information regarding servings and portions was provided to assist participants to calculate consumption ("1 serving of fruits/vegetables is equal to ½ cup of chopped, fresh, or canned fruits/vegetables").

Alcohol consumption. The three-item Alcohol Use Disorders Identification Test – Consumption (AUDIT-C) was adapted to the day-level and employed to assess alcohol consumption (Bradley et al., 2007). The AUDIT-C is a brief version of the 10-item AUDIT measure (Babor, De La Fuente, Saunders, & Grant, 1989) with the three-item version performing similarly to the 10-item version as far as successful identification of alcohol misuse (Kriston, Holzel, Weiser, Berner, & Harter, 2008; Reinert & Allen, 2007). The AUDIT-C identifies typical frequency, quantity of drinking and heavy drinking or active alcohol dependence and abuse. Example items include "Did you have a drink containing alcohol today?" and "Did you have six or more drinks today?" High scores suggest hazardous drinking or active alcohol use disorders. The AUDIT-C items are scored on a five-point scale ranging from never (1) to four or more times/week (5). A precursor item asking whether or not participants consumed alcohol preceded the AUDIT-C measure in the online survey, so only individuals who indicated they consumed alcohol were asked to respond to the three AUDIT-C questions.

Tobacco-related behaviour. Tobacco consumption was assessed in participants who indicated they were current smokers (precursor item). Nicotine dependence was measured using a total of nine

items consisting of the six-item Fagerstrom Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) and tobacco use was measured using a three-item tobacco use scale (Molina, Fernandez , Delgado, & Martin, 2010). Both measures were adapted to the day level. Example items for nicotine dependence include "How many cigarettes did you smoke today?" and "Did you find it difficult not to smoke in places where it is banned today?" Example items for tobacco use include "Which cigarette gave you the greatest satisfaction today?" and "Did any of the people you live with smoke today?" This combined nine-item tobacco consumption measure (six-item nicotine dependence and three-item tobacco use scales) has been employed previously by Molina and colleagues (2010) who reported the measure to have high sensitivity and specificity (sensitivity = 85.3%; specificity = 95.3%) measuring cotinine concentration in participants' saliva. Nicotine dependence items (Fagerstrom Test) were scored on a four-point scale corresponding to items assessing nicotine dependence relative to the number of cigarettes reportedly smoked on the same day (i.e., "1-10," "11-20," "21-30," "30+"). Higher scores on the questionnaire suggested higher nicotine dependence.

Personal resources. The Psychological Capital Questionnaire-12 (PCQ-12) was used to measure participants' perceptions of four personal resources (self-efficacy, optimism, hope and resilience; Luthans, Avolio, Avey, & Norman, 2007; Luthans, Youssef, & Avolio, 2006, 2007). The scale consists of 12 items and is scored on a six-point scale (1= *Strongly disagree*; 6 = *Strongly agree*). All items were adapted to the day level. Example items include "Today, I felt confident presenting information to a group of colleagues" (self-efficacy factor), "Today, I saw myself as being pretty successful at work" (optimism factor), "Today, when I found myself in a jam at work, I could think of many ways to get out of it" (hope factor) and "Today, I took stressful things at work in my stride" (resilience factor). The PCQ-12 has shown consistently high levels of internal reliability in a number of studies (ranging from .84 to .92; León-Pérez, Antino, & León-Rubio, 2016; Wernsing, 2014).

Job demands and job resources. A brief 12-item version of the Job Content Questionnaire (JCQ; Karasek, Brisson, Kawakami, Houtman, & Bongers, 1998) was used to measure participants' perceived levels of job demands and job resources. The original JCQ contains 49 items and includes a

number of subscales scored on a scale ranging from one (*strongly disagree*) to four (*strongly agree*). For the present study, selected items from five subscales were identified following confirmatory factor analyses (CFA) using responses from 459 participants from Study 2 and were adapted to the daily level. I selected items for retention using both conceptual (i.e., preserve content validity) and statistical criteria (i.e., factor loading > .40). The original JCQ incorporates three subscales measuring job demands (psychological demands, physical demands and job insecurity) and four subscales measuring job resources (skill discretion, decision authority, supervisor and colleague social support). In terms of job demands, only psychological demand was included in the present study (e.g., "Today, I had enough time to get the job done") because physical demands were irrelevant in the context of this study (i.e., the study sample consisted of employees in typically sedentary occupations) and statistical tests indicated poor model-data fit for the job insecurity factor. In terms of job resources, skill discretion (e.g., "Today, I got to do a variety of different things on my job"), decision authority (e.g., "Today, I had a lot of say about what happened on my job"), supervisor social support (e.g., "Today, my supervisor paid attention to what I was saying"), and co-worker social support (e.g., "The people I worked with today were friendly") subscales were included. The JCQ has been shown to be valid and reliable across a number of studies (Alexopoulos, Argyriou, Bourna, & Bakoyannis, G., 2015; Amin, Quek, Oxley, Noah, & Nordin, 2015; Cheng, Luh, & Guo, 2003; Choobineh, Ghaem, & Ahmedinejad, 2011; Li, Yang, Liu, Xu, & Cho, 2004).

Burnout. A brief three-item version of the Maslach Burnout Inventory – General Survey (MBI-GS) (Maslach, Jackson, & Leiter, 1996) was used to assess burnout among participants (i.e., individuals' feelings about their job on a spectrum ranging from engagement to burnout). The original MBI-GS consists of 16 items, embedded within three factors (exhaustion, professional efficacy and cynicism) and is scored on a scale ranging from one (*never*) to seven (*every day).* Three items were derived from the original 16-item measure following a CFA using responses from 459 participants from Study 2 and adapted to the daily level: "I felt used up at the end of the workday today" (exhaustion factor), "Today, I felt less interested in my work compared to when I started this job" (cynicism factor), and "Today at work, I felt confident that I was effective in getting things done" (professional efficacy factor). The construct validity of the MBI-GS has been supported across a

number of countries (Bria, Spanu, Baban, & Dimitrascu, 2014; Kitaoka-Higashiguchi et al., 2004; Richardsen & Martinussen, 2005).

Work engagement. Three items were derived from the original 9-item Utrecht Work Engagement Scale – 9 (UWES-9; Schaufeli, Bakker, & Salanova, 2006) following confirmatory factors analysis (CFA) using Study 2 data and adapted to the daily level: "Today at my job, I felt strong and vigorous" (vigour factor), "Today, I was immersed in my work" (absorption factor), and "Today, I was enthusiastic about my job" (dedication factor) were employed to measure participants' work engagement. The original UWES-9 consists of three factors (vigour, dedication and absorption) and is scored on a six-point scale ranging from one (strongly disagree) to six (strongly agree). The UWES-9 has demonstrated good construct validity in past studies (e.g., Nerstad, Richardsen, & Martinussen, 2009; Seppälä et al., 2009).

Procedure

Recruitment was carried out over a six-month period (June – December 2016) consisting of three recruitment strategies. The first strategy involved informing cross-sectional survey study (chapter III) participants about a follow-up study. Consistent with the cross-sectional study, the present study was advertised as a university study to understand health behaviours and their associations with workplace factors. A total of 35 Study 2 participants indicated they were interested in the follow-up study and were asked to provide their name and contact details (as cross-sectional study participants otherwise remained anonymous). After contacting these individuals to provide information about the follow-up study, 27 agreed to participate and eight individuals indicated they were no longer interested. The second strategy involved advertising the study (i.e., aims and criteria, incentives) to organisations and individuals who might have been interested and eligible for participation. For example, a number of Curtin University staff members were recruited after advertising the study in the university's newsletter. A number of participants from the general public were also recruited after a 30-second advertisement of the study on a local radio station (advertisement aired on Curtin FM for a period of 8 weeks). A third strategy involved snowball sampling through other participants who referred their eligible colleagues or friends who were in

similar occupations. Information about the study and participant consent were obtained via electronic mail. Data was collected via a secure online survey hosted on the Qualtrics online platform (https://www.qualtrics.com/au/).

Following an eligibility assessment, new participants (i.e., individuals who had not taken part in Study 2) were asked to respond to a brief demographics questionnaire that was only completed once. Following this assessment, the principal investigator organised individual meetings with each participant, provided instructions about the study and loaned a wrist-worn accelerometer watch for the 14-day period to each participant. Participants were asked to wear the accelerometer watch on their non-dominant wrist with the charging prongs facing toward their elbow for fourteen consecutive days. A customised survey link (also optimised for smartphones and tablets; Appendix F) was sent to participants before the study commenced, and participants were asked to complete the survey once at the end of each workday (e.g., Monday to Friday). Participants were instructed to wear the accelerometer throughout the full study period. Upon completion of the 14-day period, accelerometers were collected by the principal investigator. All participants (dropouts and those who completed the study) were compensated with a $15 gift card that could be redeemed at a range of local stores. The study was approved by Curtin University's Human Research Ethics Committee (RDHS-271-15).

Statistical Analyses

Owing to the non-independence of the data (i.e., daily observations nested within individuals), the primary analyses were performed within a multilevel framework. Two preliminary steps were executed initially to ascertain the need for multilevel modelling. First, the decomposition of variance across daily assessments (level 1) and between individuals (level 2) was assessed via the intra-class correlation coefficient (ICC). The ICC captures the degree of between-person variability relative to the total variation, such that the variation ascribed to within-person dynamics is calculated as 1 – ICC. Broadly, an ICC value greater than .05 suggests that multilevel modelling is required (Dyer, Hanges, & Hall, 2005). Second, the ICC was employed to calculate the design effect (1 + ([average cluster – 1] x ICC)), which provides an indication of the degree to which standard errors are misspecified if the clustered nature of the data are ignored (Kish, 1965). Statistical simulations

indicate that a design effect greater than two requires the clustered nature of data to be taken into consideration via multilevel modelling (Muthén & Satorra, 1995). The primary analyses were guided by recommendations from Bolger and Laurenceau (2013) whereby all predictor variables were decomposed into separate variables to capture the between-person (level 2; mean for each participant across their daily assessment) and within-person (level 1; average daily deviation from the stable person mean) aspects of the data. Level 1 variables were person-centred such that each data point deviates around an individual's overall mean across the study period. Level 2 variables were grand mean centred so that each individual's average score across the study period deviates on the mean of the total sample. All analyses encompassed random intercepts with fixed slopes and controlled for age, body mass index and gender (0 = male, 1 = female) at level 2.

The theoretical sequence of the JD-R model was first tested to examine the direct effects of job demands, job resources, and personal resources on burnout and engagement. Two models were tested in the primary analyses: (i) one in which health behaviours were modelled as distal outcomes of the JD-R theoretical sequence, and (ii) another in which health behaviours were modelled as proximal outcomes of demands and resources (see Model 1 and 2). As such, the decomposition of separate study variables at levels 1 and 2 included job demands, job resources, personal resources, burnout and engagement in Model 1, but excluded burnout and engagement in Model 2. Additionally, the indirect effects of job demands, job resources, and personal resources on burnout, engagement and health behaviours in Model 1 were examined within a multilevel structural equation framework because of its superiority to traditional multilevel modelling in terms of bias, coverage, efficiency, convergence and power (Preacher, Zhang, & Zyphur, 2011; Preacher, Zyphur, & Zhang, 2010). These analyses were executed within a multilevel framework in M*plus* 8 (Muthén & Muthén, 2015) using a robust maximum likelihood estimated (MLR) in conjunction with full-information likelihood estimation to make full use of all raw data, which produces minimally biased estimates compared with other techniques for handling missing data (e.g., listwise deletion; Enders & Bandalos, 2001). Models were tested separately with only one health behaviour included as part of the theoretical sequence. The assessment of model-data fit was guided by the consideration of multiple criteria, namely the χ^2 goodness-of-fit index, comparative fit index (CFI), Tucker-Lewis index (TLI), standardized root

square mean residual (SRMR), and root mean square error of approximation (RMSEA), with evidence of adequate fit indicated by CFI/TLI ≥ .90 and RMSEA ≤ .08 (Marsh et al., 2005).

Results

Preliminary Analyses

Descriptive statistics for the sample and bivariate correlations among study variables at both levels of analysis are presented in Table 4. Significant associations were found between JD-R model constructs at both the within- and between-person level. In terms of associations between health behaviours, at the within-person level, only sleep and MVPA were found to be moderately associated (r = .35, p = .010). At the between-person level, positive moderate associations were found between fruit and vegetable consumption (r = .35, p = .001) and negative moderate associations were found between fruit and light physical activity (LPA; r = -.26, p = .013), and vegetable consumption and sleep (r = -.24, p = .036). In terms of associations between JD-R model constructs and health behaviours, significant associations were found at both the within- and between-person level, however, associations at the within-person level were found to be negligible. At the between-person level, burnout was moderately associated with sleep (r = .55, p = .000), job resources were moderately associated with fruit (r = .28, p = .034) and vegetable consumption (r = .35, p = .004), and personal resources were weakly associated with LPA (r = .22, p = .006). An inspection of the ICC and design effect values supported the need to account for the non-independence in the data via multilevel analyses (see Table 5).

Jobs-Demand Resources Model

The standardised effects for the analysis of the JD-R theoretical sequence are detailed in Table 6. Overall, the findings revealed mixed support for the expected effects of demands and resources on burnout and engagement at both within- and between-person levels of analysis. At the within-person level, job demands (β = .15, p = .007) and job resources (β = -.10, p = .036) were salient determinants of burnout (r = .150, p = .007). With regard to engagement, job demands (β = .16, p < .001) and personal resources (β = .55, p < .001) were identified as important antecedents. Job resources, job demands, and personal resources were moderately correlated with each other (.25 < r < .35). At the between-level, job resources was a significant determinant of burnout (β = -.39, p =. 03)

and engagement (β = .20, p =. 01). Additionally, personal resources was a meaningful contributor to the explained variance of engagement (β = .69, p <.001). Job resources, job demands, and personal resources were strongly correlated with each other (.53 < *r* < .71).

Health Behaviours as a Distal Outcome

For all health behaviours, fit indices suggested the model represented a good fit with the data (see Table 7). The standardised effects are detailed in Table 8. When health behaviours were modelled as a distal outcome of the JD-R theoretical sequence, at the between-person level, burnout was found to predict sleep (*p* <.001, β = .501, 95% CI = .250 – .752). All other effects were small and non-significant (*p* >.05).

Health Behaviours as a Proximal Outcome

For all health behaviours, fit indices suggested the model represented a good fit with the data (see Table 7). The standardised effects are detailed in Table 9. When health behaviours were modelled as proximal outcomes of the JD-R theoretical sequence, at the between-person level, job resources were found to predict vegetable consumption (*p* = .003, β = .600, 95% CI = .202 – .998) and moderate and vigorous physical activity (MVPA; *p* = .03, β = -.227, 95% CI = -.424 – -.029), and personal resources were found to predict sleep behaviour (*p* = .02, β = .375, 95% CI = -.689 – -.060) and LPA (*p* = .04, β = .293, 95% CI = .009 – .578). All other effects were small and non-significant (*p* >.05).

Table 4
Descriptive Statistics and Bivariate Correlations Among all Study Variables.

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Alcohol	-	.18	-.14	.22	.01	.17	-.03	.04	-.09	-.06	-.12	-.01	.05
2	Cigarette	.02	-	-.06	-.12	-.05	-.06	.05	-.02	.02	-.02	-.05	-.04	-.01
3	Fruit	-.07	.00	-	.35	-.16	.11	-.26	-.05	-.04	.20	.24	.28	.17
4	Vege	-.07	-.03	.06	-	-.24	.23	-.07	.01	-.18	.03	-.01	.35	.10
5	Sleep	-.06	.03	.00	.09	-	.08	-.06	.30	.55	-.16	.06	-.12	-.20
6	Sedentary	-.13	-.06	.05	.03	.11	-	-.18	.16	-.03	.08	.18	.09	.09
7	LPA	-.02	.01	.00	.07	.16	-.06	-	.66	-.01	.10	.20	.11	.23
8	MVPA	-.07	.02	.04	.09	.35	.22	.79	-	.12	.04	.14	.02	.13
9	Burnout	.00	.02	.08	-.04	-.02	.07	.01	.05	-	-.16	.05	-.25	-.11
10	Engagement	.01	-.04	-.04	.07	-.05	-.02	.02	-.00	.04	-	.62	.75	.90
11	Job demands	-.04	-.04	.03	.00	.05	-.30	.06	.04	.20	.35	-	.56	.64
12	Job resources	-.05	-.01	-.02	-.05	.05	-.02	-.00	-.00	-.05	.30	.25	-	.74
13	Personal resources	-.04	-.02	-.03	.00	.06	-.03	-.03	-.03	.05	.63	.31	.35	-
	M	.63	.27	.90	.96	518.90	687.07	230.70	57.45	4.06	4.88	2.77	3.40	5.12
	SD	1.46	.52	1.61	1.70	135.82	116.24	121.99	119.84	.93	1.28	.50	.61	.75
	Skew	3.21	7.62	3.82	.32	2.12	-.10	3.69	7.10	.28	-1.03	.37	-0.74	-2.02
	Kurtosis	11.44	56.85	40.74	-.26	5.74	.68	20.66	52.79	-.46	.81	.73	1.44	5.22

Note: * $p < .05$; within-person (level 1) correlations are below the diagonal; between-person (level 2) correlations are above the diagonal. Grey shade = statistically significant estimate at $p < .05$.

Table 5
Estimates of Intercept-Only (or Null) Model Including all Study Variables.

	Level 1		Level 2					
	Variance	*p*	Mean	*p*	Variance	*p*	ICC	Design Effect
Alcohol	1.46	<.001	.63	<.001	.69	.10	.32	3.70
Cigarette	.004	.31	.06	.31	.24	.31	.98	9.26
Fruit	1.48	.05	1.89	<.001	1.09	<.001	.43	4.63
Vege	1.24	<.001	2.92	<.001	1.70	<.001	.58	5.89
Sleep	12463.08	<.001	517.49	<.001	5588.73	.001	.31	3.61
Sedentary	8892.05	<.001	684.20	<.001	4445.70	<.001	.33	3.78
LPA	8946.20	.04	229.50	<.001	5035.57	.01	.37	4.12
MVPA	9485.24	.17	54.24	<.001	3753.40	.19	.29	3.44
Burnout	.39	<.001	4.07	<.001	.48	<.001	.56	5.72
Engagement	.70	<.001	4.86	<.001	.98	<.001	.58	5.89
Job demands	.15	<.001	2.77	<.001	.11	<.001	.43	4.63
Job resources	.12	<.001	3.40	<.001	.24	.001	.66	6.56
Personal resources	.27	<.001	5.11	<.001	.30	.01	.53	5.47

Note: average cluster size = 9.431.

Table 6
Standardised Estimates from the Multilevel Analysis of the Job-Demands Resources model.

	Level 1		Level 2	
	β	*p*	β	*p*
Job demands → burnout	.17	.003	.25	.10
Job resources → burnout	-.10	.036	-.39	.03
Personal resources → burnout	.03	.63	.03	.88
Job demands → engagement	.16	<.001	.06	.34
Job resources → engagement	.08	.11	.20	.01
Personal resources → engagement	.55	<.001	.69	<.001
Burnout ↔ engagement	-.01	.84	-.07	.62
Job demands ↔ job resources	.25	<.001	.53	<.001
Job demands ↔ personal resources	.31	<.001	.61	<.001
Job resources ↔ personal resources	.35	<.001	.71	<.001

Note: grey shade = statistically significant estimate at $p < .05$.

Table 7
Model-data Fit Statistics.

	χ^2	df	*p*	RMSEA	CFI	TLI	$SRMR_{within}$	$SRMR_{between}$
Model 1: alcohol	28.27	21	.14	.023	.987	.971	.018	.092
Model 1: fruit	25.00	21	.25	.017	.993	.983	.008	.095
Model 1: LPA	32.57	21	.05	.030	.981	.955	.014	.091
Model 1: MVPA	31.90	21	.06	.029	.983	.961	.011	.092
Model 1: sedentary	22.79	21	.36	.012	.997	.993	.008	.097
Model 1: sleep	27.92	21	.14	.023	.987	.970	.029	.098
Model 1: vegetable	39.60	21	.00	.038	.968	.926	.018	.100
Model 2: alcohol	22.17	15	.10	.028	.987	.959	.000	.093
Model 2: fruit	22.29	15	.10	.802	.986	.956	.000	.092
Model 2: LPA	22.24	15	.10	.028	.987	.960	.000	.092
Model 2: MVPA	22.15	15	.10	.028	.989	.964	.000	.092
Model 2: sedentary	22.10	15	.10	.027	.987	.958	.000	.096
Model 2: sleep	22.17	15	.10	.805	.986	.955	.000	.100
Model 2: vegetable	22.23	15	.10	.803	.987	.958	.000	.092

Table 8
Standardised Estimates from the Multilevel Analysis of Model 1 (Health Behaviour as a Distal Outcome of JD-R Model).

	Level 1 (within-person)			Level 2 (between person)		
	β	95% CI	*p*	β	95% CI	*p*
Burnout → alcohol	.002	-.058, .062	.94	.009	-.298, .317	.95
Engagement → alcohol	.005	-.052, .062	.87	-.093	-.298, .112	.38
Burnout → fruit	.120	-.006, .247	.06	.100	-.163, .363	.46
Engagement → fruit	-.087	-.198, .025	.13	.173	-.078, .425	.18
Burnout → vegetable	-.043	-.112, .026	.22	-.177	-.456, .102	.22
Engagement → vegetable	.070	-.014, .154	.10	.016	-.245, .276	.91
Burnout → sleep	-.020	-.136, .095	.73	.501	.250, .752	.00
Engagement → sleep	-.038	-.166, .090	.56	-.114	-.305, .077	.24
Burnout → sedentary	.055	-.023, .133	.16	.143	-.162, .449	.36
Engagement → sedentary	-.014	-.117, .088	.78	-.004	-.294, .286	.98
Burnout → LPA	.007	-.086, .099	.89	.006	-.487, .499	.98
Engagement → LPA	.013	-.074, .099	.78	.137	-.039, 313	.13
Burnout → MVPA	.045	-.017, .107	.16	.191	-.292, .674	.44
Engagement → MVPA	-.004	-.063, .056	.90	.045	-.144, .233	.64

Note: CI = confidence interval; grey shade = statistically significant estimate at $p < .05$.

Table 9
Standardised Estimates from the Multilevel Analysis of Model 2 (Health Behaviour as a Proximal Outcome of JD-R Model).

	Level 1 (within person)			Level 2 (between person)		
	β	95% CI	*p*	β	95% CI	*p*
Job demands → alcohol	-.016	-.086, .055	.66	-.234	-.468, .001	.05
Job resources → alcohol	-.048	-.171, .075	.45	-.115	-.441, .211	.49
Personal resources → alcohol	-.022	-.145, .102	.73	.263	-.067, .593	.12
Job demands → fruit	.046	-.045, .137	.33	.226	-.114, .565	.19
Job resources → fruit	-.022	-.126, .081	.67	.199	-.125, .523	.23
Personal resources → fruit	-.050	-.177, .076	.43	-.118	-.500, .264	.55
Job demands → vegetable	.159	-.077, .134	.002	-.277	-.505, -.049	.017
Job resources → vegetable	-.077	-.139, .021	.09	.600	.202, .998	.003
Personal resources → vegetable	.023	-.116, .135	.67	-.163	-.516, .190	.37
Job demands → sleep	.040	-.082, .162	.52	.274	-.055, .603	.10
Job resources → sleep	.025	-.121, .171	.74	-.002	-.302, .297	.99
Personal resources → sleep	.047	-.151, .245	.64	.375	-.689, -.060	.02
Job demands → sedentary	-.015	-.114, .083	.76	.199	-.120, .519	.22
Job resources → sedentary	-.003	-.129, .123	.96	.045	-.334, .424	.82
Personal resources → sedentary	-.029	-.167, .124	.78	-.173	-.517, .172	.33
Job demands → LPA	.073	.012, .134	.02	.093	-.308, .494	.65
Job resources → LPA	-.004	-.094, .086	.93	-.151	-.429, .127	.29
Personal resources → LPA	-.051	-.194, .092	.48	.293	.009, .578	.04
Job demands → MVPA	.062	.016, .107	.01	.150	-.276, .577	.49
Job resources → MVPA	-.002	-.106, .107	.97	-.227	-.424, -.029	.03
Personal resources → MVPA	-.047	-.138, .044	.31	.192	-.118, .502	.22

Note: CI = confidence interval; grey shade = statistically significant estimate at $p < .05$.

Discussion

Using daily diary methodology, the study aim was to examine between- and within-person associations between employee health behaviours and constructs from the JD-R model over two working weeks. The study results indicated partial support for H1a, and full support for H2a, H2b, and H3b confirming two JD-R model propositions. Support was found for the motivational (job resources as determinants of work engagement; level 2) and health impairment (job demands as determinants of burnout) processes (proposition 2) as well as the buffering role of personal resources (i.e., being similar to job resources being a contributor to explaining the variance in work engagement; level 1 and 2 associations; proposition five).

An unexpected finding regarding the role of job demands in the health-impairment process partially supported H1a. Specifically, on days when participants reported experiencing high levels of

job demands, they were more likely to report higher levels of burnout as originally hypothesised (H1a) but also higher levels of engagement. This is contrary to JD-R theory (i.e., increased levels of job demands are expected to lead to burnout via the health-impairment process) and the original hypothesis (H1b). This finding may be explained by past research differentiating between types of job demands, namely, challenge and hindrance job demands (e.g., LePine et al., 2005; Van den Broeck, De Cuyper, De Witte, & Vansteenkiste, 2010). Prior research in Japanese private sector employees (*N* = 10,229) has shown that certain challenge job demands (e.g., high workload, time pressure) are positively associated with work engagement, whereas other hindrance job demands (e.g., role ambiguity) are negatively associated with work engagement (Inoue et al., 2013, 2014). Furthermore, one more recent study has shown support for the notion of challenge demands by revealing associations between time pressure and work engagement (suggesting an inverted U-shape; Schmitt, Ohly, & Kleepsies, 2015). Specifically, Schmitt and colleagues (2015) found that moderate levels of time pressure optimally stimulated employees and were related to high levels of work engagement and high levels of time pressure revealing dysfunction for work engagement. This is broadly consistent with the aforementioned findings of the present study showing associations between high levels of job demands and high levels of engagement. However, as job demands were conceptualised and measured using a single construct in this study, it is possible that associations identified with both burnout and engagement can be attributed to such different types of demands.

Consistent with the findings of the cross-sectional survey study (chapter III), employees were found to engage in a combination of health-enhancing and health-impairing behaviours. In regards to Model 1 (health behaviours as distal outcomes of JD-R processes), only one significant and unexpected level 2 association was found. Individuals who, on average, reported higher levels of burnout over the study period reported greater sleep duration. While the literature suggests that shorter employee sleep duration (e.g., sleep disturbance or sleep difficulties) is associated with heightened levels of burnout (Barber, Grawitch, & Munz, 2013; De Beer, Pienaar, & Rothmann Jr, 2014; Peterson et al., 2008), this association may be interpreted as employee efforts to recover from burnout. That is, employees who report higher levels of burnout also report greater sleep duration so as to

recover from the negative effects of burnout (e.g., exhaustion). Results of a previous diary study investigating diurnal patterns of sleep in Swedish employees reporting burnout (N = 24) may shed light on how this association might be explained (Söderström, Ekstedt, Åkerstedt, Nilsson, & Axelsson, 2004). In their study, Söderström and colleagues' results revealed two burnout groups (low burnout, high burnout) indicating that employees in the high burnout group exhibited impaired recovery on their day off work, a higher likelihood of bringing work home and week-end work time, and more complaints regarding work/life balance (i.e., work interfering with leisure time). It is therefore possible that employees in this study sample who experienced burnout slept for longer in an effort to recover. Another possibility is that employees who experienced burnout also suffered from depression. This interpretation is based on the reported overlap between burnout and clinical depression in the literature (and absence of burnout diagnostic criteria to differentiate between the two; Bianchi, Schonfeld, & Laurent, 2015). If employees who reported burnout also reported longer sleep duration and suffered from depression, then their reported longer sleep duration may be explained by positive associations between depression and long sleep duration (e.g., Mohan, Xiaofan, & Yingxian, 2017; Zhai, Zhang, & Zhang, 2015).

In regards to Model 2 (health behaviours as proximal outcomes of JD-R processes), the results were consistent with Study 2 findings as well as previous empirical work. Support was found for the hypotheses that job demands (H1c), job resources (H2c), and personal resources (H3c) affect some health behaviours directly. Concerning employees' diet, level 1 associations revealed that on days when participants experienced high levels of job demands, they reported higher levels of vegetable consumption compared to days when they experienced low levels of job demands (level 1 associations). This finding may be explained by employee coping planning (i.e., formulating a coping response such as coping planning). Sniehotta (2009) supports that employees may engage in coping planning to protect themselves from a risk situation (e.g., lack of time for engaging healthy behaviours such as consuming fruits and vegetables). Such risk situations may occur as a result of increased job demands (e.g., time pressure) and reduced job resources (e.g., low job control; Sniehotta, 2009). As such, it is likely that employees who experienced high levels of job demands in

the present study formed coping plans ahead of time and enacted them leading to higher consumption of vegetables. Previous research studies demonstrate that action planning (i.e., when, where and how plans) and coping planning (i.e., plans to overcome obstacles) bridge the intention-behaviour relation (e.g., intention and physical activity) and are considered effective resources (e.g., Scholz, Schüz, Ziegelmann, Lippke, & Schwarzer, 2008; Schwarzer et al., 2007). Moreover, level 2 associations revealed that participants who, on average, perceived a greater degree of job resources over the study period were also more likely to consume more vegetables. Though there is limited research available on job resources and FVC, the results of Payne, Jones and Harris' (2005) study help understand these findings. Payne and colleagues (2005) investigated the impact of job strain on exercise and healthy eating within the framework of the theory of planned behaviour in a sample of sedentary employees (N = 286; Ajzen, 1991). The sample was characterised by moderate-to-high levels of job demands and job resources. With regards to healthy eating (i.e., total scores for fruits and vegetables and for sweets and snack foods), unfavourable work conditions (high demands and low resources) were found to be associated with an increased likelihood of consuming sweets and snack foods. Besides stress, consumption of sweets and snacks ('high density foods'; Greeno & Wing, 1994) was attributed to stress and a lack of time to consume healthy foods due to increased job demands. It is likely that sufficient resources (such as job control) allow for intention realisation (i.e., employees realising their increased intention to consume unhealthy foods) and lead to increased FVC as evidenced by level 2 associations (i.e.. greater perceived job resources were associated with greater consumption of vegetables).

Regarding physical activity (PA), level 1 associations showed that on days when participants experienced high levels of job demands, they also engaged in higher levels of light physical activity (LPA) and moderate and vigorous physical activity (MVPA). This finding is supported by a longitudinal study assessing the long-term effects of PA on job strain (measured by indicators of job demands and job control) in an ongoing sample of Finnish subjects (N = 861; The Cardiovascular Risk in Young Finns Study) (Yang et al., 2010). Yang and colleagues' (2010) study results showed an inverse association between baseline PA and job demands (and job strain), and direct, positive

association between PA and job control (a job resource) after adjusting for demographic and health factors. Level 2 associations indicated that participants who, on average, perceived a greater degree of personal resources over the study period were more likely to engage in greater levels of LPA and sleep for longer. A diary study investigating the interaction of exercise (assessed using self-reports of minutes participants engaged in one of the following activities: cycling, jogging, swimming, walking, fitness, ball sports, dancing, and other activities) and sleep (assessed using a single, self-report item) on employee personal resources in a sample of full-time employees (N =144) indicates support for the notion that health behaviours (i.e., exercise, sleep) are associated with perceptions of increased personal resources (Nägel & Sonnentag, 2013). Specifically, Nägel and Sonnentag (2013) showed that exercising after work predicted the next day's levels of personal resources when sleep duration during the night was longer than the previous night (i.e., one *SD* above the mean; SD = 0.99). Finally, level 2 associations also indicated that participants who, on average, perceived greater levels of job resources over the study period engaged in less MVPA. The findings of a cross-sectional study in sample of UK government employees (N = 5,235) examining associations between the psychosocial work environment and leisure time physical activity align with those of the present study (Houdmont et al., 2015). Houdmont and colleagues (2015) found that some job resources (such as job control and social support from colleagues) were weakly and negatively associated with LTPA among men, while other job resources (such as clarity of job role) were also weakly and negatively associated with LPTA among women. Other research employing Karasek's (1979) demand-control model has shown that job resources (e.g., job control) are associated with small effects on employee LPTA for passive jobs and stronger effects for high-strain jobs (Lin, McCullagh, Kao, & Larson, 2014). Considering the occupational sample of the present study (i.e., employees in sedentary occupations) and the aforementioned evidence linking high job resources to decreased levels of PA, this association is congruous with past evidence.

Conceptual and Practical Implications of Study Findings

Regarding the conceptual implications of this study's findings, following on from the cross-sectional survey study (chapter III), further evidence is presented for the relevance of health

behaviours to JD-R model constructs. In the present study, a daily diary design was employed and objective measurement of certain health behaviours was obtained. Consistent with previous research (e.g., Fodor, Antoni, & Wiedermann, 2014; Houdmont et al., 2015; Söderström et al., 2004), this study showed that some health behaviours (i.e., sleep duration, PA, vegetable consumption) are related to certain constructs included in the JD-R (e.g., job demands, job resources, personal resources, burnout, engagement). The specific role of (each of) these health behaviours in JD-R processes is worth exploring further in future research, as it is likely that some behaviours may play an important role within these processes (similar to past research successfully linking JD-R processes to health outcomes; Brauchli, Jenny, Füllemann, & Bauer, 2015). Based on the evidence of this study, health behaviours should be conceptualised as proximal outcomes of JD-R. Another implication of the present study's findings extends to the evidence presented for the associations between personal resources and two health behaviours (i.e., sleep duration and LPA). This is significant considering personal resources are a more recent addition to the JD-R model (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007a), and that evidence on associations between personal resources and employee health behaviours is limited with one exception (Nägel & Sonnentag, 2013).

Regarding the study's implications for practice, the results showed that employees engage in a combination of health-enhancing and health-impairing behaviours at moderate levels, with health-enhancing behaviours being associated with favourable organisational outcomes (e.g., high engagement and low burnout; also consistent with Study 2 results). The possible conceptual implications are the two possibilities about how health behaviours might relate to JD-R constructs. The first possibility is that health-enhancing behaviours are likely to be used as a coping mechanism against increased job demands as has been suggested previously (e.g., Payne et al., 2012). The second possibility is that health-enhancing behaviours are likely to be used as a recovery mechanism to counteract the negative effects of job strain or burnout (stemming from a combination of sustained high job demands and low job resources; e.g., Söderström et al., 2004). Consistent with past research (Yang et al., 2010), positive associations were found between increased job demands and higher levels of engagement in LPA and MVPA suggesting PA may be a way to cope with job stress.

Similarly, positive associations were observed between higher levels of burnout and increased sleep duration indicating sleep is likely to function as a recovery mechanism from the negative effects of burnout. The evidence supports that employee health behaviours are proximal outcomes of JD-R processes and may function as both coping and recovery mechanisms against strain and burnout, Workplace health promotion efforts should focus on promoting employee behaviours that are health-enhancing (e.g., fruit provision in the workplace; Pescud et al., 2016) and minimising behaviours that are health-impairing (e.g., smoking cessation in the workplace; Fishwick et al., 2013).

Study Strengths and Limitations

To the best of my knowledge, this is the only study to date that has examined a range of employee health behaviours in relation to JD-R model constructs on the day level, forming one of its key strengths (i.e., the daily diary study design enabling the study of temporal associations between multiple health behaviours and JD-R constructs). Another important strength of this study is the objective measurement of some employee behaviours (i.e., PA and sleep using GENEActiv data). Device-based data is more accurate compared to self-reported data in observed scores (e.g., accurately capturing data at various exertion levels of physical activity; Prince et al., 2008) in occupational health research besides recent support showing device-based data increase methodological transparency (Innerd et al., 2015) and eliminate problems associated with participant recall, affective states (e.g., negative affectivity) and response styles (e.g., social desirability; Kompier, 2005; Spector, 2006). Furthermore, the study findings contribute to knowledge revealing direct associations between employee engagement in health-enhancing behaviours and work-related well-being. Notwithstanding these strengths, there are limitations to this study that should be considered when interpreting the results. First, self-report measures were used for assessment of some employee health behaviours (i.e., alcohol consumption, tobacco consumption, and fruit and vegetable consumption). Subjective data (i.e., using self-report measures) is known to be associated with problems with common method variance in the psychosocial work environment (e.g., Chang, Van Witteloostuijn, & Eden, 2010) and problems with error when measuring certain health behaviours (e.g., fruit and vegetable consumption; Miller, Abdel-Maksoud, Crane, Marcus, & Byers, 2008). Second, although it is common in diary

studies to use shortened measures of full scales to reduce participant fatigue (Fisher & To, 2012), it is possible that these measures may be limited in their representation on the content space of these concepts. It is suggested that, in future, researchers integrate device-based data (i.e., using objective measures) or metrics of work-related well-being and/or measures of work performance (e.g., comparing employee and supervisor assessments of performance) with self-reports in assessing the psychosocial work environment. Similarly, researchers should consider employing objective measures of health behaviours (e.g., nutritional biomarkers for dietary assessment) that are not prone to systematic bias like self-report measures (Kuhnle, 2012). Last but not least, future designs should employ measures that differentiate between challenge and hindrance job demands (Rodell & Judge, 2009).

Conclusion

The results of the present study suggest that health behaviours are likely proximal rather than distal outcomes of JD-R constructs, and highlight two possible ways by which health behaviours may function within JD-R processes (coping and recovery mechanisms). Health-enhancing behaviours were associated with favourable organisational outcomes (work engagement) and work well-being (low burnout scores). Future research should consider health behaviours (e.g., sleep, PA) as recovery and coping strategies to deal with job strain and burnout.

Chapter IV Summary

The majority of existing research investigating the associations between employee health behaviours and JD-R processes is subject to certain conceptual and methodological limitations. First, most available studies in occupational health psychology have adopted cross-sectional survey designs that do not consider the temporal and dynamic associations between the variables. Second, these studies usually employ self-report measures of health behaviours despite associated limitations pertaining to measurement and bias. In the present study, I employed a daily diary design to address these limitations and to examine the positioning of health behaviours as proximal or distal outcomes of JD-R processes. The daily diary design enabled the consideration of the situational and day-to-day context addressing some of the limitations pertaining to biases in self-report measures. Further, while

the study included self-report measures, measurement of some health behaviours was obtained using accelerometers which is reportedly more accurate compared to self-report data in terms of observed scores (Prince et al., 2008). The results showed support for the conceptualisation of health behaviours as proximal – rather than distal – outcomes of the motivational and health impairment processes of the JD-R model. The findings suggest health behaviours may function as coping and/or recovery mechanisms within JD-R processes. Future research should consider the use of objective measures of health behaviours and work well-being.

CHAPTER V: GENERAL SUMMARY, SYNTHESIS AND DISCUSSION

Summary of Findings

The aims of this project were to (1) map out studies in the literature investigating associations between employee health behaviours and job demands-resources model (JD-R; Demerouti et al., 2001a, 2001b) constructs; (2) identify job demands and resources typologies of employees and examine their differences on burnout, engagement, and health behaviours; and (3) use a dynamic research design to examine two models testing ways in which employee health behaviours may be related to JD-R model constructs.

Employing Arksey and O'Malley's (2005) methodological framework, through the first study (Chapter II), I scoped the literature to determine what is known about the associations between health behaviours and JD-R model constructs between 2001 and 2017. Citation information (e.g., authors, publication date, title, etc.) from a total of 8,321 across six databases (CINAHL, PubMed, PsychINFO, PsychArticles, Scopus, and Web of Science) was extracted and imported into a reference management software (EndNote). After removing duplicates and scanning articles by title and abstract, 65 articles were identified as relevant to the main research question (RQ) and full-text screened. Of these 65 articles, only nine met the study criteria and were included in the review. In terms of study design, the majority were found to employ a cross-sectional survey design (five of nine included studies). A quality assessment of included studies based on EPPI's Weight of Evidence framework (Gough, 2007) indicated only two (of nine included) studies were of high methodological and topic relevance to the main RQ. This scoping study revealed there is currently limited evidence for the associations between health behaviours and JD-R model constructs.

Building on the findings of the scoping study, in the next study (Chapter III), I identified typologies of (job) demands and (personal and job) resources and examined their differences on burnout, engagement and a range of health behaviours using a person-centered approach. Data were collected using a cross-sectional survey design from employees of Western Australian organisations

in typically sedentary occupations (office workers). The results of the study revealed three distinct typologies based on demands and resources ('minimally resourced', 'balanced', and 'resourceful') characterised by mainly by quantitative (rather than qualitative) differences between them. In terms of JD-R constructs, resourceful profile members displayed the lowest burnout and highest work engagement scores (in comparison to resourceful profile members) suggesting personal resources might buffer the negative effects of burnout and promote work engagement in line with JD-R theory (Xanthopoulou et al., 2007). When compared on differences in health behaviours, the results indicated that employees reporting the greatest levels of well-being generally engaged in a more adaptive pattern of health behaviours. These findings suggest engagement in health-enhancing behaviours may protect employee well-being, and that a combination of moderate levels of job demands and sufficient job resources are associated with more adaptive health behaviour profiles in employees.

In Chapter IV, I investigated the way in which health behaviours are situated within JD-R by testing two distinct models. The first model suggested health behaviours are a distal outcome of JD-R processes. The second model proposed health behaviours are a proximal outcome of JD-R processes. Data were collected using a daily diary study design from a sample of sedentary employees based in Western Australia over a 14-day period. The results revealed only one significant association when health behaviours were modelled as distal outcomes of JD-R processes. On the contrary, a number of significant associations were revealed when health behaviours were modelled as proximal outcomes of JD-R processes. Specifically, job demands, job resources and personal resources were found to predict health behaviours directly.

Synthesis of Findings

Collectively, the findings highlighted the need to study a range of health behaviours concurrently (and not in isolation; Conner & Norman, 2017). Three overarching questions were generated to synthesise the project findings (Q1 to Q3).

Q1: Are health behaviours relevant to the JD-R model?

Using cross-sectional survey (Chapter III) and daily diary (Chapter IV) methodologies, health behaviours were shown to be directly associated with JD-R constructs (job demands, job resources, personal resources) revealing differences on burnout and engagement scores. Collectively, the findings indicated that while health-enhancing behaviours (e.g., MVPA, high sleep quality) are associated with favourable psychosocial working environment conditions (moderate-to-large amounts of job resources and moderate amounts of job demands) and work well-being (high levels of engagement and low levels of burnout; Chapter III), health-enhancing behaviours (e.g., grater sleep duration, high vegetable consumption) are also associated with unfavourable psychosocial working environment conditions (large amounts of job demands) and low work well-being (high levels of burnout; Chapter 4). The findings are congruous with some available research showing the relevance of health behaviours to JD-R costructs (e.g., Alexandrova-Kamarova et al., 2016; Gram Quist et al., 2013; Nishi et al., 2017). The results of the scoping review study confirmed the lack of evidence in this area of investigation by revealing a limited number of studies examining these associations (chapter II; De Beer et al., 2014; Frone, 2016).

Q2: Which health behaviours are more pertinent across the studies?

The health behaviours examined in this thesis are among the most widely studied behaviours in the health psychology literature (Conner & Norman, 2017; Leger, Poursain, Neubauer, & Uchiyama, 2008). Findings from the three studies contained within this thesis suggest that the most pertinent health behaviours are sleep, physical activity, and fruit and vegetable consumption, and to a lesser extent, tobacco consumption. Chapter II results revealed that sleep behaviour has received the most attention in the literature vis-à-vis the JD-R model over the past 17 years (De Beer et al., 2014; Liu et al., 2017). The findings detailed in Chapter III indicated that engagement in (moderate and vigorous) physical activity, getting adequate and good quality sleep, and low consumption of tobacco were associated with work well-being with one exception (participants reporting poor work well-being also reported consuming more vegetables compared to participants reporting high work well-being). Chapter IV results showed that when faced with high job demands, participants consumed (more) vegetables and engaged in (increased levels of light and moderate) physical activity. When

participants experienced high job resources, they consumed (more) vegetables and engaged in (decreased moderate and vigorous) physical activity.

Q3: What is the function of health behaviours within JD-R?

The function of health behaviours could not be determined from the findings presented in this thesis. However, two possible functions of health behaviours within JD-R processes are hypothesised. The first possibility is that health behaviours may enable employees to cope with unfavourable psychosocial working environment characteristics such as increased job demands (e.g., Payne, Jones, & Harris, 2012). Chapter IV results indicated positive associations between increased job demands and engagement in health-enhancing behaviours (i.e., increased vegetable consumption, higher levels of engagement in light and moderate intensity physical activity) showing some support for this hypothesis. Although previous research investigating associations between health behaviours and increased job demands has revealed decreased engagement in physical activity levels and increased unhealthy eating (e.g., Liu et al., 2017; Payne, Jones, & Harris, 2010), engagement in health-enhancing behaviours as coping response to work stress has been suggested previously (Payne, Jones, & Harris, 2012). The second possibility is that health behaviours may assist employees to recover from the negative effects of burnout and exhaustion. From the results presented in chapter IV, positive associations between high reported burnout levels and increased sleep duration were identified. It is likely that employees who reported burnout also slept longer in an effort to recover from the negative effects of burnout. Past research has shown that sleep physiology (e.g., reduced sleep latency, arousal frequency and fragmentation) improves with recovery from burnout (Ekstedt, Söderström, & Åkerstedt, 2009). The proposed hypotheses are consistent with chapter V findings showing health behaviours are closely involved in JD-R processes.

Limitations and Directions for Future Research

This research project was subject to limitations. Limitations and directions for future research pertaining to the studies in this thesis are organised thematically below.

Searches and Identification of Relevant Articles

First, results of searches conducted for chapter II may be improved in future research by employing a wider range of search terms to describe the constructs under review. For example, researchers undertaking a review in this area are advised to include specific components or sub-dimensions of JD-R constructs in their searches. This is because certain studies in the literature have measured specific subcomponents of JD-R constructs. As an example, assessments of job demands in the literature have included scales for measuring psychological workload, job stressors and fatigue, among others (JCQ; Karasek et al., 1998). Similarly, burnout has been shown to consist of three dimensions including exhaustion, depersonalisation (also known as cynicism and disengagement) and professional efficacy (Maslach et al., 1996) that are used interchangeably in the literature. Future research should incorporate specific sub-dimensions of all JD-R constructs in the search strategy.

Study Design

Third, the results presented in chapter III preclude inferences about causality due to the use of a cross-sectional study design. Future research should consider employing alternative designs such as measurement-burst designs (e.g., obtaining stress measurements once every three months over a 12-month period; Stawski, MacDonald, & Sliwinski, 2015). Measurement-burst designs capture improved estimates of long-term change in the data (i.e., precision and power), and allow for differentiation between intraindividual variability across temporal intervals (Sliwinski, 2008). Employing a measurement-burst design may untangle the job demands – personal resources interaction. According to the JD-R framework, personal resources are assumed to buffer the impact of (hindrance) job demands on strain, and boost the desirable impact of (challenge) demands on motivation (Bakker & Demerouti, 2017; LePine, Podsakoff, & LePine, 2005). Another possibility could be to use experimental designs which may help in determining cause – effect relations. For example, employees could be randomly allocated to either a control or an experimental condition. In the experimental condition, stress could be induced by providing negative feedback on a work-related task (Schonfeld & Chang, 2017, pp. 39-68), then subsequently observe how participants decided to engage in a range of health behaviours when presented with the opportunities. Such a design could shed light on cause – effect relations between health behaviours and JD-R model constructs.

Measurement and Data Collection

Fourth, data collected in Chapter III (and some of the data collected in Chapter IV) employed self-report measures that are known to be associated with cognitive (e.g., social desirability bias) and memory bias (e.g., recall; Paulhus & Vazire, 2007). An alternative to self-reported data is device-based data (Guo, Yu, Xiang, Li, & Zhang, 2017). A typical device used for capturing physical data is wearable accelerometer devices (e.g., accelerometer watches). Such devices provide estimates of the frequency and intensity of movement, and data are summarised using total counts, average daily counts per minute and average time being sedentary (or engaging in light, moderate or vigorous physical activity; Sera, Griffiths, Dezateux, Geraci, & Cortina-Borja, 2017). Another recent device-based method to collect behavioural data are mobile phone technologies such as smartphone sensing methods (Harari et al., 2016). Smartphone sensing encompasses a plethora of data collected about owners' lifestyle including social context (e.g., social interactions and communications), daily activities (e.g., physical activity levels or sleeping patterns) and mobility patterns (e.g., time spent in various locations; Harari, Gosling, Wang, & Campbell, 2015). The use of objective measures of both health behaviours and the psychosocial working environment should also be explored in future research. Objective measures (or metrics) of the psychosocial work environment could include supervisor observations (e.g., performance reviews) or biomarkers as indicators of work-related stress (e.g., hair cortisol samples; Kompier, 2005; Van Der Meij, Gubbels, Schaveling, Almela, & Van Vugt, 2018).

Implications for Theory and Practice

The evidence presented in this project suggests important theoretical implications for the relevance of health behaviours in the psychosocial work environment. First, health behaviours were suggested to be proximal, rather than distal, outcomes of JD-R model processes (i.e., job demands, job resources and personal resources affected health behaviours directly; chapter IV). This suggests involvement of health behaviours in the dual process of the JD-R. Work engagement and burnout are considered cognitive-affective outcomes within the JD-R model. Health behaviours could be considered behavioural outcomes of job demands (health-impairment process) and job resources

(motivational process; Houdmont & Leka, 2010; Schaufeli et al., 2002). In this context of the JD-R model, health behaviours might be thought of as modifiable behavioural factors that interact with each other, and cognitive-affective outcomes (work engagement, burnout) of the psychosocial working environment (job demands, job resources) to predict employee mental (e.g., positive affect; Reed & Buck, 2009) and physical well-being (e.g., body mass index, triglyceride and lipoprotein levels; He, Chen, Zhan, Wu, & Opler, 2014). While previous attempts have been made to integrate health outcomes within the JD-R framework (e.g., Brauchli et al., 2015), no research to-date has considered integrating health behaviours. Second, two possible functions of health behaviours are hypothesised: (1) to enable employees to cope with increased job demands, and (2) to assist employees in recovering from the negative effects of burnout. Some of these functions have been proposed by past research (e.g., Ekstedt, Söderström, & Åkerstedt, 2009; Payne et al., 2012; Söderström, Ekstedt, Åkerstedt, Nilsson, & Axelsson, 2004). Third, additional implications relate to the associations identified between personal resources and health-enhancing behaviours (chapters III and IV). Consistent with JD-R theory and previous findings (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007), personal resources were found to protect against burnout and promote work engagement (chapter III). Moreover, personal resources were found to function synergistically with health-enhancing behaviours (i.e., light intensity physical activity and longer sleep duration) indicating further support for the coping function of health behaviours (see Q3, p. 112) Personal resources have been found to interact with health behaviours in other research and should be considered in relation to the psychosocial working environment in future research (Nägel & Sonnentag, 2013).

In terms of implications for practice, the project findings are relevant to employers and employees alike. At the employer level, the findings add to the existing body of literature highlighting the importance of sustaining a healthy and productive workforce (e.g., Kowalski & Loretto, 2017). While employee well-being and performance have been shown to improve by interventions such as job redesign and on-the-job training (Daniels, Gedikli, Watson, Semkina, & Vaughn, 2017), there are currently important challenges pertaining to workplace well-being where attention should be drawn. Examples of such challenges include job insecurity (i.e., permanent versus temporary and zero-hour

contracts; Standing, 2016), intensification of work (i.e., contemporary workload is increasingly intensifying; Kelliher & Anderson, 2010), place of work (i.e., increasing flexibility on when/where work is conducted; Redman, Snape, & Ashurst, 2009) and migrant worker populations (i.e., reliance on migrant workers due to skill shortages; Bahn, 2015). It would be important to consider health behaviours in these contexts (e.g., remote or migrant employee samples), or in relation to specific job characteristics (e.g., zero-hour versus permanent contract employees). At the employee level, health behaviours are malleable and therefore within individuals' control, as opposed to aspects of the psychosocial work environment (e.g., job design, job demands or other JD-R constructs) that are not within individuals' control. As such, employees should seek to engage in health-enhancing (e.g., sufficient/good quality sleep, moderate intensity physical activity) and avoid health-impairing behaviours (e.g., excessive alcohol consumption, increased sedentary behaviour) to maximise their likelihood of experiencing work well-being. Further, it is likely that certain health-enhancing behaviours may be beneficial for mental and physical health when individuals are faced with increased job demands or experience job strain.

Conclusions

This doctoral research aimed to enhance understanding of health behaviours vis-à-vis work-related well-being through a series of studies. A scoping review study was carried out to determine the magnitude of research evidence on associations between health behaviours and constructs of the JD-R model. The results of this foundational study revealed limited evidence for the aforementioned associations, and led to the development of the cross-sectional study and identification of JD-R typologies. Significant differences between the profiles on health behaviours and burnout/engagement were identified indicating combinations of job demands and resources are associated with employee health profiles. These formative studies led to the final study examining the positioning of health behaviours within the context of the JD-R framework as distal outcomes of the dual pathway, or proximal outcomes of demands and resources. Using a daily diary design, the results supported the proximal positioning of health behaviours within the JD-R framework with job demands, job resources and personal resources predicting health behaviours directly.

References

Ahola, K., & Hakanen, J. (2007). Job strain, burnout, and depressive symptoms: A prospective study among dentists. *Journal of Affective Disorders, 104,* 103-110. doi: 10.1016/j.jad.2007.03.004

Ahola, K., Pulkki-Raback, L., Kouvonen, A., Rossi, H., Aromaa, A., & Lonnqvist, J. (2012). Burnout and behavior-related health risk factors: Results from the population-based Finnish Health 2000 study. *Journal of Occupational and Environmental Medicine, 54,* 17-22. doi: 10.1097/JOM.0b013e31823ea9d9

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50,* 179-211. Retrieved from https://www.sciencedirect.com/

Åkerstedtet, T., Garefelt, J., Richter, A., Westerlund, H., Hanson, L., Sverke, M., & Kecklund, G. (2015). Work and sleep – A prospective study of psychosocial work factors, physical work factors, and work rescheduling. *Sleep, 38,* 1129-1136. doi: 10.5665/sleep.4828

Alexandrova-Kamarova, A., Todorova, I., Montgomery, A., Panagopoulou, E., Costa, P., Baban, A., … Mijakoski, D. (2016). Burnout and health behaviors in health professionals from seven European countries. *International Archives of Occupational and Environmental Health, 89,* 1059-1075. doi: 10.1007/s00420-016-1143-5

Alexopoulos, E., Argyriou, E., Bourna, V., & Bakoyannis, G. (2015). Reliability and validity of the Greek version of the job content questionnaire in Greek health care workers. *Safety and Health at Work, 6,* 233-239. doi: 10.1016/j.shaw.2015.02.003

Alker, H., Wang, M., Pbert, L., Thorsen, N., & Lemon, S. (2015). Impact of school staff health on work productivity in secondary schools in Massachusetts. *Journal of School Health, 85,* 398-404. doi: 10.1111/josh.12266

Alvarez, G., & Ayas, N. (2004). The impact of daily sleep duration on health: A review of the literature. *Progress in Cardiovascular Nursing, 19,* 56-59. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/

Alves, A., Viana, J., Cavalcante, S., Oliveira, N., Duarte, J., Mota, J., … Ribeiro, F. (2016). Physical activity in primary and secondary prevention of cardiovascular disease: Overview updated. *World Journal of Cardiology, 8,* 575-583. doi: 10.4330/wjc.v8.i10.575

Amin, N., Quek, K., Oxley, J., Noah, R., & Nordin, R. (2015). Validity and reliability of Malay version of the job content questionnaire among public hospital female nurses in Malaysia. *International Journal of Occupational and Environmental Medicine, 6,* 232-242. Retrieved from http://www.theijoem.com/

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology, 8,* 19-32. doi: 10.1080/1364557032000119616

Armon, G., Melamed, S., Toker, S., & Shapira, I. (2014). Joint effect of chronic medical illness and burnout on depressive symptoms among employed adults. *Health Psychology, 33,* 264-272. doi: 10.1037/a0033712

Arvidson, E., Borjesson, M., Ahlborg, G., Lindegard, A., & Jonsdottir, H. (2013). The level of leisure time physical activity is associated with work ability – a cross sectional and prospective study of healthcare workers. *BMC Public Health, 13,* 1-6. doi: 10.1186/1471-2458-13-855

Asparouhov T, Muthén B. (2013). *Auxiliary variables in mixture modeling: A 3-step approach using Mplus 2013. Mplus Web Notes, 15*. Retrieved from http://ww.statmodel.com/examples/webnotes

Australian Bureau of Statistics (2010). *Australian labour market statistics: Trends in hours worked*. Retrieved from http://www.abs.gov.au/ausstats/

Australian Government, Department of Health. (2014). *Australia's physical activity and sedentary behaviour guidelines for adults (18-64 years)*. Retrieved from https://www.health.gov.au

Australian Institute of Health and Welfare. (2011). *Australian burden of disease study: Impact and causes of illness and death in Australia 2011*. Retrieved from https://www.aihw.gov.au/

Australian Institute of Health and Welfare. (2016). *Australia's health 2016*. Retrieved from https://www.aihw.gov.au/

Australian Public Service Commission (2013). *State of the service 2012-2013*. Retrieved from http://www.apsc.gov.au/

Australian Public Service Commission. (2014). *Working together: Promoting mental health and wellbeing at work*. Retrieved from http://www.apsc.gov.au/

Azagba, S., & Sharaf, M. (2011). The effect of job stress on smoking and alcohol consumption. *Health Economics Review, 1*, 15. doi: 10.1186/2191-1991-1-15

Babor, T., De La Fuente, J., Saunders, J., & Grant, M. (1989). *AUDIT: The alcohol use disorders identification test. Guidelines for use in primary health care*. World Health Organization, Geneva.

Backman, D., Gonzaga, G., Sugerman, S., Francis, D., & Cook, S. (2011). Effect of fresh fruit availability at worksites on the fruit and vegetable consumption of low-wage employees. *Journal of Nutrition, Education and Behavior, 43*, S113-S121. doi: 10.1016/j.jneb.2011.04.003

Badger, D., Nursten, J., Williams, P., & Woodward, M. (2000). Should all literature reviews be systematic? *Evaluation and Research in Education, 14*, 220-230. doi: 10.1080/09500790008666974

Bahn, S. (2015). Managing the well-being of temporary skilled migrants. *International Journal of Human Resource Management, 26*, 2102-2120. doi: 10.1080/09585192.2014.971849

Bakken, B., & Torp, S. (2012). Work engagement and health among industrial workers. *Scandinavian Journal of Organizational Psychology, 4*, 4-20. Retrieved from http://sjop.no/

Bakker, A. (2011). An evidence-based model of work engagement. *Current Directions in Psychological Science, 20*, 265-269. doi: 10.1177/0963721411414534

Bakker, A. (2014). Daily fluctuations in work engagement: An overview and current directions. *European Psychologist, 19*, 227-236. doi: 10.1027/1016-9040/a000160

Bakker, A. & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology, 22*, 309-328. doi: 10.1108/02683940710733115

Bakker, A., & Demerouti, E. (2017). Job demands-resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology, 22*, 273-285. doi: 10.1037/ocp0000056

Bakker, A., & Sanz-Vergel, A. (2013). Weekly work engagement and flourishing: The role of hindrance and challenge demands. *Journal of Vocational Behavior, 83*, 397-409. doi: 10.1016/j.jvb.2013.06.008

Bakker, A., Demerouti, E., & Euwema, M. (2005). Job resources buffer the impact of job demands on burnout. *Journal of Occupational Health Psychology, 10,* 170-180. doi: 10.1037/1076-8998.10.2.170

Bakker, A., Demerouti, E., & Schaufeli, W. (2003a). Dual processes at work in a call centre: An application of the job demands-resources model. *European Journal of Work and Organizational Psychology, 12,* 393-417. doi: 10.1080/13594320344000165

Bakker, A., Demerouti, E., & Schaufeli, W. (2010). Dual processes at work in a call centre: An application of the job demands-resources model. *European Journal of Work and Organizational Psychology, 12,* 393-417. doi: 10.1080/13594320344000165

Bakker, A., Demerouti, E., & Verbeke, W. (2004). Using the job demands-resources model to predict burnout and performance. *Human Resource Management, 43,* 83-104. doi: 10.1002/hrm.20004

Bakker, A., Demerouti, E., De Boer, E., & Schaufeli, W. (2003). Job demands and job resources as predictors of absence duration and frequency. *Journal of Vocational Behavior, 62,* 341-356. doi: 10.1016/S0001-8791(02)00030-1

Bakker, A., Demerouti, E., Taris, T., Schaufeli, W., & Schreurs, P. (2003). A multi-group analysis of the job demands-resources model in four home care organisations. *International Journal of Stress Management, 10,* 16-38. doi: 10.1037/1072-5245.10.1.16

Bakker, A., Hakanen, J., Demerouti, E., & Xanthopoulou, D. (2007). Job resources boost work engagement, particularly when job demands are high. *Journal of Educational Psychology, 99,* 274-284. doi: 10.1037/0022-0663.99.2.274

Bakker, A., Van Veldhoven, M., & Xanthopoulou, D. (2010). Beyond the demand-control model: Thriving on high job demands and resources. *Journal of Personnel Psychology, 9,* 3-16. doi:10.1027/1866-5888/a000006

Banks, S., & Dinges, D. (2007). Behavioral and physiological consequences of sleep restriction. *Journal of Clinical Sleep Medicine, 3,* 519-528. Retrieved from https://www.researchgate.net/

Barber, L., & Santuzzi, A. (2015). Please respond ASAP: Workplace telepressure and employee recovery. *Journal of Occupational Health Psychology, 20,* 172-189. doi: 10.1037/a0038278

Barber, L., Grawitch, M., & Munz, D. (2013). Are better sleepers more engaged workers? A self-regulatory approach to sleep hygiene and work engagement. *Stress Health, 29,* 307-316. doi: 10.1002/smi.2468

Basinska, B., Wiciak, I., & Dåderman, A. (2014). Fatigue and burnout in police officers: The mediating role of emotions. *Policing: An International Journal of Police Strategies & Management, 37,* 665-680. doi: 10.1108/PIJPSM-10-2013-0105

Bennett, G., Wolin, K., Avrunin, J., Stoddard, A., Sorensen, G., Barbeau, E., & Emmons, K. (2006). Does race/ethnicity moderate the association between job strain and leisure time physical activity? *Annals of Behavioral Medicine, 32,* 60–67. doi: 10.1207/s15324796abm3201_7

Bennie, J., Chau, J., Van Der Ploeg, H., Stamatakis, E., Do, A., & Bauman, A. (2013). The prevalence and correlates of sitting in European adults – a comparison of 32 Eurobarometer participating countries. *International Journal of Behavioral Nutrition and Physical Activity, 10,* 107. doi: 10.1186/1479-5868-10-107

Bergin, A., & Jimmieson, N. (2014). Australian lawyer well-being: Workplace demands, resources and the impact of time-billing targets. *Psychiatry, Psychology and Law, 21,* 427-441. doi: 10.1080/13218719.2013.822783

Berset, M., Elfering, A., Luthy, S., Luthi, S., & Semmer, N. (2011). Work stressors and impaired sleep: Rumination as a mediator. *Stress and Health, 27*, e71-e82. doi: 10.1002/smi.1337

Bethlehem, J. (2010). Selection bias in web surveys. *International Statistical Review, 78*, 161-188. doi: 10.1111/j.1751-5823.2010.00112.x

Bianchi, R., Schonfeld, I., & Laurent, E. (2015). Burnout-depression overlap: A review. *Clinical Psychology Review, 36*, 28-41. doi: 10.1016/j.cpr.2015.01.004

Bize, R., Johnson, J., & Plotnikoff, R. (2007). Physical activity level and health-related quality of life in the general population: A systematic review. *Preventive Medicine, 45*, 401-415. doi: 10.1016/j.ypmed.2007.07.017

Bolge, S., Doan, F., Kannan, H., & Baran, R. (2009). Association of insomnia with quality of life, work productivity, and activity impairment. *Quality of Life Research, 18*, 415-422. doi: 10.1007/s11136-009-9462-6

Bolger, N., & Laurenceau, J.-P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research*. New York, NY: Guilford Press. Retrieved from https://books.google.com.au/

Book of Lists. (2014). *Western Australia's most accurate and comprehensive business listing*. Retrieved from https://www.businessnews.com.au/article/Book-of-Lists

Borst, R., Kruyen, P., & Lako, C. (2017). Exploring the job demands-resources model of work engagement in government: Bringing in a psychological perspective. *Review of Public Personnel Administration, 7*, 1-26. doi: 10.1177/0734371X17729870

Bradley, K., DeBenedetti, A., Volk, R., Williams, E., Frank, D., & Kivlahan, D. (2007). AUDIT-C as a brief screen for alcohol misuse in primary care. *Alcoholism: Clinical and Experimental Research, 31*, 1208-1217. doi: 10.1111/j.1530-0277.2007.00403.x

Bradley, K., Kivlahan, D., & Williams, E. (2009). Brief approaches to alcohol screening: Practical alternatives for primary care. *Journal of General Internal Medicine, 24*, 881-883. doi: 10.1007/s11606-009-1014-9

Brauchli, R., Jenny, G., Füllemann, D., & Bauer, G. (2015). Towards a job demands-resources health model: Empirical testing with generalizable indicators of job demands, job resources, and comprehensive health outcomes. *BioMed Research International*, 959621. doi: 10.1155/2015/959621

Brawley, O. (2011). Avoidable cancer deaths globally. *CA: A Cancer Journal for Clinicians, 61*, 67-68. doi: 10.3322/caac.20108

Bria, M., Spanu, F., Baban, A., & Dimitrascu, D. (2014). Maslach burnout inventory – general survey: Factorial validity and invariance among Romanian healthcare professionals. *Burnout Research, 1*, 103-111. doi: 10.1016/j.burn.2014.09.001

Brisson, C., Larocque, B., Moisan, J., Vézina, M., & Dagenais, G. (2000). Psychosocial factors at work, smoking, sedentary behavior, and body mass index: A prevalence study among 6995 white collar workers. *Journal of Occupational and Environmental Medicine, 42*, 40-46. Retrieved from https://www.ncbi.nlm.nih.gov/

Brown, F., Buboltz, W., & Soper, B. (2002). Relationship of sleep hygiene awareness, sleep hygiene practices, and sleep quality in university students. *Behavioral Medicine, 28*, 33-38. doi: 10.1080/08964280209596396

Brown, H., Gilson, N., Burton, N., & Brown, W. (2011). Does physical activity impact on presenteeism and other indicators of workplace well-being? *Sports Medicine, 41*, 249-262. doi: 10.2165/11539180-000000000-00000.

Brown, J. (1991). Staying fit and staying well: Physical fitness as a moderator of life stress. *Journal of Personality and Social Psychology, 60*, 555-561. doi: 10.1037/0022-3514.60.4.555

Bulotaitė, L., Šorytė, D., Vičaitė, S., Šidagytė, R., Lakiša, S., Vanadziņš, I., … Lerssi-Uskelin, J. (2017). Workplace health promotion in health care settings in Finland, Latvia, and Lithuania. *Medicina, 53*, 348-356. doi: 10.1016/j.medici.2017.10.002

Burton, W., Conti, D., & Chen, C. (1999). The role of health risk factors and disease on worker productivity. *International Journal of Occupational and Environmental Health, 41*, 863-877. doi: 10.1097/00043764-199910000-00007

Bush, K., Kivlahan, D., McDonell, M., Fihn, S., & Bradley, K. (1998). The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Archives of Internal Medicine, 158*, 1789-1795. doi: 10.1001/archinte.158.16.1789

Butler, A., Grzywacz, J., Bass, B., & Linney, K. (2005). Extending the demands-control model: A daily diary study of job characteristics, work-family conflict and work-family facilitation. *Journal of Occupational and Organizational Psychology, 78*, 155-169. 10.1348/096317905X40097

Buysse, D., Reynolds, C., Monk, T., Berman, S., & Kupfer, D. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193-213. doi: 10.1016/0165-1781(89)90047-4

Byrne, D., Rolando, L., Aliyu, M., McGown, P., Connor, L., Awalt, B., … & Yarbrough, M. (2016). Modifiable healthy lifestyle behaviors: 10-year health outcomes from a health promotion program. *American Journal of Preventive Medicine, 51*, 1027-1037. doi: 10.1016/j.amepre.2016.09.012

Cameron, D., Bertenshaw, E., & Sheeran, P. (2018). Positive affect and physical activity: Testing effects on goal setting, activation, prioritisation, and attainment. *Psychology & Health, 33*, 258-274. doi: 10.1080/08870446.2017.1314477

Campos-Rodriguez, F., Martinez-Garcia, M., De La Cruz-Moron, I., Almeida-Gonzalez, C., Catalan-Serra, P., & Montserrat, J. (2012). *Annals of Internal Medicine, 156*, 115-122. 10.7326/0003-4819-156-2-201201170-00006

Cappuccio, F., D'Elia, L., Strazzullo, P., & Miller, M. (2010). Sleep duration and all-cause mortality: A systematic review and meta-analysis of prospective studies. *Sleep, 33*, 585-592. doi: 10.1111/j.1365-2869.2008.00732.x

Carpentera, J., & Andrykowskia, M. (1998). Psychometric evaluation of the Pittsburgh sleep quality index. *Journal of Psychosomatic Research, 45*, 5-13. doi: 10.1016/S0022-3999(97)00298-5

Carskadon, M., & Dement, W. (2005). Normal human sleep: An overview. In Kryger, M., Roth, T., & Dement, W. (Eds.). *Principles and practice of sleep medicine. 4th edition* (pp. 13-23). doi: 10.1016/B0-72-160797-7/50009-4

Carter, B., Abnet, C., Feskanich, D., Freedman, N., Hartge, P., Lewis, C., … Jacobs, E. (2015). Smoking and mortality – beyond established causes. *The New England Journal of Medicine, 372*, 631-640. doi: 10.1056/NEJMsa1407211

Caspersen, C., Powell, K., & Christenson, G. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100,* 126-131. doi: 10.2307/20056429

Cassidy, S., Chau, J., Catt, M., Bauman, A., & Trenell, M. (2017). Low physical activity, high television viewing and poor sleep duration cluster in overweight and obese adults: A cross-sectional study of 398,984 participants from the UK Biobank. *International Journal of Behavioral Nutrition and Physical Activity, 14,* 57. doi: 10.1186/s12966-017-0514-y

Castillo-Retamal, M., & Hinckson, E. (2011). Measuring physical activity and sedentary behaviour at work: A review. *Work, 40,* 345-357. doi: 10.3233/WOR-2011-1246

Cecil, J., McHale, C., Hart, J., & Laidlaw, A. (2014). Behaviour and burnout in medical students. *Medical Education Online, 19,* 25209. doi: 10.3402/meo.v19.25209

Cedernaes, J., Schiöth, H., & Benedict, C. (2015). Determinants of shortened, disrupted, and mistimed sleep and associated metabolic health consequences in healthy humans. *Diabetes, 64,* 1073-1080. doi: 10.2337/db14-1475

Celis-Morales, C., Perez-Bravo, F., Ibañez, L., Salas, C., Bailey, M., & Gill, J. (2012). Objective vs. self-reported physical activity and sedentary time: Effects of measurement method on relationships with risk biomarkers. *PLoS One, 7,* e36345. doi: 10.1371/journal.pone.0036345

Chang, S., Van Witteloostuijn, & Eden, L. (2010). From the editors: Common method variance in international business research. *Journal of International Business Studies, 41,* 178-184. doi: 10.1057/jibs.2009.88

Chau, J., Merom, D., Grunseit, A., Rissel, C., Bauman, A., & van der Ploeg, H. (2012). Temporal trends in non-occupational sedentary behaviours from Australian time use surveys 1992, 1997, and 2006. *International Journal of Behavioral Nutrition and Physical Activity, 9,* 76-83. doi: 10.1186/1479-5868-9-76

Chau, J., Van Der Ploeg, H., Dunn, S., Kurko, J., & Bauman, A. (2011). A tool for measuring workers' sitting time by domain: The workforce sitting questionnaire. *British Journal of Sports Medicine, 45,* 1216-1222. doi: 10.1136/bjsports-2011-090214

Cheng, Y., Luh, W., & Guo, Y. (2003). Reliability and validity of Chinese version of the job content questionnaire in Taiwanese workers. *International Journal of Behavioral Medicine, 10,* 15-30. doi: 10.1207/S15327558IJBM1001_02

Chikritzhs, T., Fillmore, K., & Stockwell, T. (2009). A healthy dose of scepticism: Four good reasons to think again about protective effects of alcohol on coronary heart disease. *Drug and Alcohol Review, 28,* 441-444. doi: 10.1111/j.1465-3362.2009.00052.x

Chinapaw, M., Mokkink, L., van Poppel, M., van Mechelen, W., & Terwee, C. (2010). Physical activity questionnaires for youth: A systematic review of measurement properties. *Sports Medicine, 40,* 539-563. doi: 10.2165/11530770-000000000-00000

Choi, B., Schnall, P., Yang, H., Dobson, M., Landsbergis, P., Israel, L., … Baker, D. (2010). Psychosocial working conditions and active leisure-time physical activity in middle aged US workers. *International Journal of Occupational Medicine and Environmental Health, 23,* 239–253. doi: 10.2478/v10001-010-0029-0

Choobineh, A., Ghaem, H., & Ahmedinejad, P. (2011). Validity and reliability of the Persian (Farsi) version of the job content questionnaire: A study among hospital nurses. *Eastern Mediterranean Health Journal, 17,* 335-341. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/

Clausen, T., Nielsen, K., Gomes-Carneiro, I., & Borg, V. (2011). Job demands, job resources and long-term sickness absence in the Danish eldercare services: A prospective analysis of registered-based outcomes. *Journal of Advanced Nursing, 68*, 127-136. doi: 10.1111/j.1365-2648.2011.05724.x

Clinton, M., Conway, N., & Sturges, J. (2017). "It's tough hanging-up a call": The relationships between calling and work hours, psychological detachment, sleep quality and morning vigor. *Journal of Occupational Health Psychology, 22*, 28-39. doi: 10.1037/ocp0000025

Collins, L. M., & Lanza, S. T. (2010). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences*. Hoboken, NJ: Wiley.

Conger, J. (1956). Reinforcement theory and the dynamics of alcoholism. *Quarterly Journal Studies on Alcohol, 17*, 296-305. Retrieved from https://www.researchgate.net/

Conner, M., & Norman, P. (2017). Health behavior: Current issues and challenges. *Psychology & Health, 32*, 895-906. doi: 10.1080/08870446.2017.1336240

Cooper, M., Frone, M., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: A motivational model of alcohol use. *Journal of Personality and Social Psychology, 69*, 990-1005. doi: 10.1037/0022-3514.69.5.990

Costa, A. (2014). *The effects of organizational justice and exercise on the relationship between job stressors and employee health* (doctoral dissertation, paper 1853). Portland State University, USA. Retrieved from https://pdxscholar.library.pdx.edu/

Coulson, J., McKenna, J., & Field, M. (2008). Exercising at work and self-reported work performance. *International Journal of Workplace Health Management, 1*, 176-197. doi: 10.1108/17538350810926534

Craig, C., Marshall, A., Sjostrom, M., Bauman, A., Booth, M., Ainsworth, B., Pratt, M., Ekelund, U., Yngve, A., Sallis, J., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise, 35*, 1381-1395. doi: 10.1249/01.MSS.0000078924.61453.FB

Dana, K., & Griffin, R. (1999). Health and well-being in the workplace: A review and synthesis of the literature. *Journal of Management, 25*, 357-384. doi: 10.1016/S0149-2063(99)00006-9

Daniels, K., Gedikli, C., Watson, D., Semkina, A., & Vaughn, O. (2017). Job design, employment practices and well-being: A systematic review of intervention studies. *Ergonomics, 60*, 1177-1196. doi: 10.1080/00140139.2017.1303085

De Beer, L. (2014). The effect of presenteeism-related health conditions on employee work engagement levels: A comparison between groups. *SA Journal of Human Resource Management, 12*, 640. doi: 10.4102/sajhrm.v12i1.640

De Beer, L., Pienaar, J., & Rothmann Jr, S. (2014). Job burnout's relationship with sleep difficulties in the presence of control variables: A self-report study. *South African Journal of Psychology, 44*, 454-466. doi: 10.1177/0081246314538249

De Graaf, A., Van De Putte, B., Nguyen, M., Zebregs, S., Lammers, J., & Neijens, P. (2017). The effectiveness of narrative versus informational smoking education on smoking beliefs, attitudes and intentions of low-educated adolescents. *Psychology & Health, 32*, 810-825. doi: 10.1080/08870446.2017.1307371

De Rezende, L., Rodrigues Lopes, M., Rey-López, J., Matsudo, V., & Luiz, O. (2014). Sedentary behavior and health outcomes: An overview of systematic reviews. *PLOS One, 9*, e105620. doi: 10.1371/journal.pone.0105620

De Spiegelaere, Ramioul, M., & Van Gyes, G. (2017). Good employees through good jobs: A latent profile analysis of job types and employee outcomes in the Belgian electricity sector. *Employee Relations, 39*, 503-522. doi: 10.1108/ER-02-2016-0034

Dean, B., Aguilar, D., Shapiro, C., Orr, W., Isserman, J., Calimlim, B., & Rippon, G. (2010). Impaired health status, daily functioning, and work productivity in adults with excessive sleepiness. *Journal of Occupational and Environmental Medicine, 52*, 144-149. doi: 10.1097/JOM.0b013e3181c99505

Deci, E., Connell, J., & Ryan, R. (1989). Self-determination in a work organization. *Journal of Applied Psychology, 74*, 580-590. doi: 10.1037/0021-9010.74.4.580

Demerouti, E., & Bakker, A. (2011). The job demands-resources model: Challenges for future research. *South African Journal of Industrial Psychology, 37*, 1-9. doi: 10.4102/sajip.v37i2.974

Demerouti, E., Bakker, A., De Jonge, J., Janssen, P., & Schaufeli, W. (2001b). Burnout and engagement at work as a function of demands and control. *Scandinavian Journal of Work, Environment and Health, 27*, 279-286. doi: 10.5271/sjweh.615

Demerouti, E., Bakker, A., Nachreiner, F., & Schaufeli, W. (2000). A model of burnout and life satisfaction amongst nurses. *Journal of Advanced Nursing, 32*, 454-464. doi: 10.1046/j.1365-2648.2000.01496.x

Demerouti, E., Bakker, A., Nachreiner, F., & Schaufeli, W. (2001a). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*, 499-512. doi: 10.1037//0021-9010.86.3.499

Di Castelnuovo, A., Costanzo, S., Bagnardi, V., Donati, M., Iacoviello, L., & De Gaetano, G. (2006). Alcohol dosing and total mortality in men and women: An updated meta-analysis of 34 prospective studies. *Archives of Internal Medicine, 166*, 2437-2445. doi: 10.1001/archinte.166.22.2437

Diallo, T., Morin, A., & Lu, H. (2016). The impact of total and partial inclusion or exclusion of active and inactive time invariant covariates in growth mixture models. *Psychological Methods, 22*, 166-190. doi: 10.1037/met0000084

Dillon, D., Dahly, D., Donnelly, D., Perry, P., Rennie, R., Li, L., & Phillips, P. (2015a). PP74 Cross-sectional analysis of weekly levels and patters of objectively measured physical behaviour with cardiometabolic health in middle-aged adults. *Journal of Epidemiology & Community Health, 69*, A84. doi: 10.1136/jech-2015-206256.170

Dillon, D., Dahly, D., Donnelly, D., Perry, P., Rennie, R., Li, L., & Phillips, P. (2015b). PP75 Daily cumulative patters of objectively measured physical activity and sedentary behaviour by cardiometabolic health status in middle-aged adults; a cross-sectional analysis. *Journal of Epidemiology & Community Health, 69*, A84-A85. doi: 10.1136/jech-2015-206256.171

Doi, Y., Minowa, M., & Tango, T. (2003). Impact and correlates of poor sleep quality in Japanese white-collar employees. *Sleep, 26*, 467-471. doi: 10.1093/sleep/26.4.467

Donaldson, S., & Grant-Vallone, E. (2002). Understanding self-report bias in organizational behavior research. *Journal of Business and Psychology, 17*, 245-260. doi: 10.1023/A:1019637632584

Dormann, C., & Van De Ven, B. (2014). Timing in methods for studying psychosocial factors at work. In M. F. Dollard, A. Shimanzu, R. Bin Nordin, P. Brough, & M. R. Tuckey (Eds.), *Psychosocial factors at work in the Asia Pacific* (pp. 89-116). doi: 10.1007/978-94-017-8975-2

Dyer, N., Hanges, P., & Hall, R. (2005). Applying multilevel confirmatory factor analysis techniques to the study of leadership. *Leadership Quarterly, 16*, 149–167. doi: 10.1016/j.leaqua.2004.09.009

Ekstedt, M., Söderström, M., & Akerstedt, T. (2009). Sleep physiology in recovery from burnout. *Biological Psychology, 82*, 267-273. doi: 10.1016/j.biopsycho.2009.08.006

Elbert, S., Dijkstra, A., & Rozema, A. (2017). Effects of tailoring ingredients in auditory persuasive health messages on fruit and vegetable consumption. *Psychology & Health, 32*, 781-797. doi: 10.1080/08870446.2017.1300259

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling, 8*, 430–457. Retrieved from https://digitalcommons.unl.edu/

Enginyurt, O., Cankaya, S., Aksay, K., Tunc, T., Koc, B., Bas, O., & Ozer, E. (2016). Relationship between organisational commitment and burnout syndrome: A canonical correlation approach. *Australian Health Review, 40*, 181-187. doi: 10.1071/AH14177

Ensel, W., & Lin, N. (2004). Physical fitness and the stress process. *Journal of Community Psychology, 32*, 81-101. doi: 10.1002/jcop.10079

European Network of Workplace Health Promotion. (2005). *Luxembourg declaration of workplace health promotion-updated*. Retrieved from http://www.enwhp.org/workplace-health-promotion.html

Faragher, E., Cass, M., & Cooper, C. (2015). The relationship between job satisfaction and health: A meta-analysis. *From Stress to Wellbeing, 1*, 254-271. doi: 10.1057/9781137310

Fisher, C., & To, M. (2012). Using experience sampling methodology in organizational behavior. *Journal of Organizational Behavior, 33*, 865-877. doi: 10.1002/job.1803.

Fishwick, D., Carroll, C., McGregor, M., Drury, M., Webster, J., Bradshaw, L., … Leaviss, J. (2013). Smoking cessation in the workplace. *Occupational Medicine, 63*, 526-536. doi: 10.1093/oc-cmed/kqt107

Fodor, D., Antoni, C., & Wiedemann, A. (2014). Healthy eating at different risk levels for job stress: Testing a moderated mediation. *Journal of Occupational Health Psychology, 19*, 259-267. doi: 10.1037/a0036267

Foster, R. (2007). Alcohol consumption: Risks and benefits. *Practice Nursing, 18*, 340-343. doi: 10.12968/pnur.2007.18.7.23960

Fransson, E.., Heikkilä, K., Nyberg, S., Zins, M., Westerlund, H., Westerholm, P., … Kivimäki, M. (2012). Job strain as a risk factor for leisure-time physical inactivity: An individual-participant meta-analysis of up to 170,000 men and women. *American Journal of Epidemiology, 176*, 1078–1089. doi: 10.1093/aje/kws336

Freak-Poli, R., Wolfe, R., Wong, E., & Peeters, A. (2014). Change in well-being amongst participants in a four-month pedometer-based workplace health program. *BMC Public Health, 14*, 953. doi: 10.1186/1471-2458-14-953

Frone, M. (2016). Work stress and alcohol use: Developing and testing a biphasic self-medication model. *Work & Stress, 30*, 374-394. doi: 10.1080/02678373.2016.1252971

Gaither, C., & Nadkarni, A. (2012). Interpersonal interactions, job demands and work-related outcomes in pharmacy. *International Journal of Pharmacy Practice, 20*, 80-89. doi: 10.1111/j.2042-7174.2011.00165.x

Gauche, C., De Beer, L., & Brink, L. (2017). Exploring demands from the perspective of employees identified as being at risk of burnout. *International Journal of Qualitative Studies on Health and Well-being, 12*, 1361783. doi: 10.1080/17482631.2017.1361783

Gerber, M., Jonsdottir, I., Lindwall, M., & Ahlborg Jr., G. (2014). Physical activity in employees with differing occupational stress and mental health profiles: A latent profile analysis. *Psychology of Sport and Exercise, 15,* 649-658. doi: 10.1016/j.psychsport.2014.07.012

Gerber, M., Lindwall, M., Börjesson, M., Hadzibajramovic, E., & Jonsdottir, I. H. (2017). Low leisure-time physical activity, but not shift-work, contributes to the development of sleep complaints in Swedish health care workers. *Mental Health and Physical Activity, 13,* 22-29. doi: 10.1016/j.mhpa.2017.09.003

Ghalichi, L., Pournik, O., Ghaffari, M., & Vingard, E. (2013). Sleep quality among health care workers. *Archives of Iranian Medicine, 16,* 100-103. doi: 013162/AIM.0010

Glise, K., Hadzibajramovic, E., Jonsdottir, I., & Ahlborg, G. (2010). Self-reported exhaustion: A possible indicator of reduced work ability and increased risk of sickness absence among human service workers. *International Archives of Occupational and Environmental Health, 83,* 511-520. doi: 10.1007/s00420-009-0490-x

Gough, D. (2007). Weight of evidence: A framework for the appraisal of the quality and relevance of evidence. *Research Papers in Education, 22,* 213-228. doi: 10.1080/02671520701296189

Gram Quist, H., Christensen, U., Christensen, K., Aust, B., Borg, V., & Bjorner, B. (2013). Psychosocial work environment factors and weight change: A prospective study among Danish healthcare workers. *BMC Public Health, 13,* 43. doi: 10.1186/1471-2458-13-43

Grander, M., Kripke, D., Yoon, I., & Youngstedt, S. (2006). Criterion validity of the Pittsburgh sleep quality index: Investigation in a non-clinical sample. *Sleep and Biological Rhythms, 4,* 129-136. 10.1111/j.1479-8425.2006.00207.x

Greeno, C., & & Wing, R. (1994). Stress-induced eating. *Psychological Bulletin, 115,* 444-464. Retrieved from http://psycnet.apa.org/

Grossi, G., Perski, A., Evengård, B., Blomkvist, V., & Orth-Gomér, K. (2003). Physiological correlates of burnout among women. *Journal of Psychosomatic Research, 55,* 309-316. doi: 10.1016/S0022-3999(02)00633-5

Guertler, D., Vandelanotte, C., Short, C., Alley, S., Schoeppe, S., & Duncan, M. (2015). The association between physical activity, sitting time, sleep duration, and sleep quality as correlates of presenteeism. *Journal of Occupational & Environmental Medicine, 57,* 321-328. doi: 10.1097/JOM.0000000000000355

Guo, H., Yu, Y., Xiang, T., Li, H., & Zhang, D. (2017). The availability of wearable-device-based physical data for the measurement of construction workers' psychological status on site: From the perspective of safety management. *Automation in Construction, 82,* 207-217. doi: 10.1016/j.autcon.2017.06.001

Ha, J., King, K., & Naeger, D. (2011). The impact of burnout on work outcomes among South Korean physical education teachers. *Journal of Sport Behavior, 34,* 343-357. Retrieved from https://www.researchgate.net/

Habibi, E., Poorabdian, S., & Shakerian, M. (2015). Job strain (demands and control model) as a predictor of cardiovascular risk factors among petrochemical personnel. *Journal of Education and Health Promotion, 4,* 16. doi: 10.4103/2277-9531.154034

Hagger, M., Wood, C., Stiff, C., & Chatzisarantis, N. (2009). The strength model of self-regulation failure and health-related behaviour. *Health Psychology Review, 3,* 208-238. doi: 10.1080/17437190903414387

Hakanen, J., Bakker, A., & Demerouti, E. (2005). How dentists cope with their job demands and stay engaged: The moderating role of job resources. *European Journal of Oral Sciences, 113*, 479-487. doi: 10.1111/j.1600-0722.2005.00250.x

Hakanen, J., Schaufeli, W., & Ahola, K. (2008). The job demands-resources model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement. *Work & Stress, 22*, 224-241. doi: 10.1080/02678370802379432

Hansen, N., Sverke, M., & Näswall, K. (2009). Predicting nurse burnout from demands and resources in three acute care hospitals under different forms of ownership: A cross-sectional questionnaire survey. *International Journal of Nursing Studies, 46*, 95-106. doi:10.1016/j.ijnurstu.2008.08.002

Harari, G., Gosling, S., Wang, R., & Campbell, A. (2015). Capturing situational information with smartphones and mobile sensing methods. *European Journal of Personality, 29*, 509–511. doi: 10.1002/per.2032

Harari, G., Lane, N., Wang, R., Crosier, B., Campbell, A., & Gosling, S. (2016). Using smartphones to collect behavioral data in psychological science: Opportunities, practical considerations, and challenges. *Perspectives on Psychological Science, 11*, 838-854. doi: 10.1177/1745691616650285

Harding, A., Wareham, N., Bingham, S., Khaw, K., Luben, R., Welch, A., & Forouhi, N. (2008). Plasma vitamin C level, fruit and vegetable consumption, and the risk of new-onset type 2 diabetes mellitus: The European prospective investigation of cancer-Norfolk prospective study. *Archives of Internal Medicine, 168*, 1493-1499. doi: 10.1001/archinte.168.14.1493

Häusser, J., & Mojzisch, A. (2017). The physical activity-mediated demand-control (pamdc) model: Linking work characteristics, leisure time physical activity, and well-being. *Work & Stress, 31*, 209-232. doi: 10.1080/02678373.2017.1303759

He, S., Chen, Y., Zhan, J., Wu, J., & Opler, M. (2014). Job burnout, mood state, and cardiovascular variables changes of doctors and nurses in a children's hospital in China. *ISRN Nursing, 386719*. doi: 10.1155/2014/386719

Heatherton, T., Kozlowski, L., Frecker, R., & Fagerstrom, K. (1991). The Fagerstrom test for nicotine dependence: A revision of the Fagerstrom tolerance questionnaire. *British Journal of Addiction, 86*, 1119-1127. doi: 10.1111/j.1360-0443.1991.tb01879.x

Hees, V., Fang, Z., Langford, J., Assah, F., Mohammad, A., Da Silva, I., … & Brage, S. (2014). Autocalibration of accelerometer data for free-living physical activity assessment using local gravity and temperature: An evaluation on four continents. *Journal of Applied Physiology, 117*, 738-744. doi: 10.1152/japplphysiol.00421.2014

Heikkilä, K., Nyberg, S., Fransson, E., Alfredsson, L., De Bacquer, Bjoerner, J. … & for the IPD-Work Consortium (2012). Job strain and tobacco smoking: An individual-participant data meta-analysis of 166 130 adults in 15 European countries. *PLoS One, 7*, e35463. doi: 10.1371/journal.pone.0035463

Heimendinger, J., Feng, Z., Emmons, K., Stoddard, A., Kinne, S., Biener, L., … Boutwell, B. (1995). The working well trial: Baseline dietary and smoking behaviors of employees and related worksite characteristics. *Preventive Medicine, 24*, 180-193. doi: 10.1006/pmed.1995.1032

Higgins, J., & Green, S. (2006). *Cochrane handbook for systematic reviews of interventions* 4.2.6 [updated September 2006]. Section 8.10. Retrieved from http://www.cochrane.org/resources/

Hipp, J., & Bauer, J. (2006). Local solutions in the estimation of growth mixture models. *Psychological Methods, 11*, 36–53. doi: 10.1037/1082-989X.11.1.36

Hobfoll, S. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*, 513-524. doi: 10.1037/0003-066X.44.3.513

Hobfoll, S. (2001). The influence of culture, community, and the nested-self in the stress process: Advancing conservation of resources theory. *Applied Psychology, 50*, 337-370. doi: 10.1111/1464-0597.00062

Hobfoll, S., Johnson, R., Ennis, N., & Jackson, A. (2003). Resource loss, resource gain, and emotional outcomes among inner city women. *Journal of Personality and Social Psychology, 84*, 632-643. doi: 10.1037/0022-3514.84.3.632

Holmes, M., Chen, W., Feskanich, D., Kroenke, C., & Colditz, G. (2005). Physical activity and survival after breast cancer diagnosis. *Journal of the American Medical Association, 293*, 2479-2486. doi: 10.1001/jama.293.20.2479

Hopstaken, J., Van Der Linden, D., Bakker, A., & Kompier, M. (2015). A multifaceted investigation of the link between mental fatigue and task disengagement. *Psychophysiology, 52*, 305-315. doi: 10.1111/psyp.12339

Houdmont, J., & Leka, S. (2010). *Contemporary occupational health psychology: Global perspectives on research and practice.* Retrieved from https://books.google.com.au/

Houdmont, J., Clemes, S., Munir, F., Wilson, K., Kerr, R., & Addley, K. (2015). Psychosocial work environment and leisure-time physical activity: The Stormont study. *Occupational Medicine, 65*, 215-219. doi: 10.1093/occmed/kqu208

Hublin, C., Partinen, M., Koskenvuo, M., & Kaprio, J. (2007). Sleep and mortality: A population-based 22-year follow-up study. *Sleep, 30*, 1245-1253. doi: 10.1093/sleep/30.10.1245

Hymel, P., Loeppke, R., Baase, C., Burton, W., Hartenbaum, N., Hudson, T., … Larson, P. (2011). Workplace health protection and promotion: A new pathway for a healthier – and safer – workforce. *Journal of Occupational and Environmental Medicine, 53*, 695-702. doi: 10.1097/JOM.0b013e31822005d0

Hyytinen, A., & Lahtonen, J. (2013). The effect of physical activity on long-term income. *Social Science & Medicine, 96*, 129-137. doi: 10.1016/j.socscimed.2013.07.019

Innerd, P., Catt, M., Collerton, J., Davies, K., Trenell, M., Kirkwood, T., & Jagger, C. (2015). A comparison of subjective and objective measures of physical activity from the Newcastle 85+ study. *Age Ageing, 44*, 691-694. doi: 10.1093/ageing/afv062

Inoue, A., Kawakami, N., Tsuno, K., Shimazu, A., Tomioka, K., & Nakanishi, M. (2013). Job demands, job resources, and work engagement of Japanese employees: A prospective cohort study. *International Archives of Occupational and Environmental Health, 86*, 441-449. doi: 10.1007/s00420-012-0777-1

Inoue, A., Kawakami, N., Tsutsumi, A., Shimazu, A., Miyaki, K., Takahashi, M., … Totsuzaki, T. (2014). Association of job demands with work engagement of Japanese employees: Comparison of challenges with hindrances (J-HOPE). *PLOS One, 9*, e91583. doi: 10.1371/journal.pone.0091583

Irish, L., Kline, C., Gunn, H., Buysse, D., & Hall, M. (2015). The role of sleep hygiene in promoting public health: A review of empirical evidence. *Sleep Medicine Reviews, 22*, 23-36. doi: 10.1016/j.smrv.2014.10.001

Irwin, M. (2015). Why sleep is important for health: A psychoneuroimmunology perspective. *Annual Review of Psychology, 66*, 143-172. doi: 10.1146/annurev-psych-010213-115205

Ishizaki, M., Morikawa, Y., Nakagawa, H., Honda, R., Kawakami, N., Haratani, T., … Yamada, Y. (2004). The influence of work characteristics on body mass index and waist to hip ratio in Japanese employees. *Industrial Health, 42*, 41-49. doi: 10.2486/indhealth.42.41

Jahedi, S., & Méndez, F. (2014). On the advantages and disadvantages of subjective measures. *Journal of Economic Behavior & Organization, 98*, 97-114. doi: 10.1016/j.jebo.2013.12.016

Janse van Rensburg, Y., Boonzaier, B., & Boonzaier, M. (2013). The job demands-resources model of work engagement in South African call centres. *SA Journal of Human Resource Management, 11*, 484. doi: 10.4102/sajhrm.v11i1.484

Johnson, B., Scott-Sheldon, L., & Carey, M. (2010). Meta-synthesis of health behavior change meta-analyses. *American Journal of Public Health, 100*, 2193-2198. doi: 10.2105/AJPH.2008.155200

Jørgensen, M., Villadsen, E., Burr, H., Punnett, L., & Holtermann, A. (2016). Does employee participation in workplace health promotion depend on the working environment? A cross-sectional study of Danish workers. *BMJ Open, 6*, e010516. doi: 10.1136/bmjopen-2015-010516

Jourdain, G., & Chênevert, D. (2010). Job demands-resources, burnout and intention to leave the nursing profession: A questionnaire survey. *International Journal of Nursing Studies, 47*, 709-722. doi: 10.1016/j.ijnurstu.2009.11.007

Judge, T., Bono, J., & Locke, E. (2000). Personality and job satisfaction: The mediating role of job characteristics. *Journal of Applied Psychology, 85*, 237-249. doi: 10.1037/0021-9010.85.2.237

Justesen, J., Eskerod, P., Christensen, J., & Sjøgaard, G. (2017). Implementing workplace health promotion – the role of middle managers. *International Journal of Workplace Health Management, 10*, 164-178. doi: 10.1108/IJWHM-04-2016-0030

Karasek, R. (1979). Job demands, job decision latitude and mental strain: Implications for job design. *Administrative Science Quarterly, 24*, 285-308. doi: 10.2307/2392498

Karasek, R., Brisson, C., Kawakami, N., Houtman, I., & Bongers, P. (1998). The job content questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology, 3*, 322-355. doi: 10.1037/1076-8998.3.4.322

Katz, A., Pronk, N., & Lowry, M. (2014). The association between optimal lifestyle-related health behaviours and employee productivity. *Journal of Occupational & Environmental Medicine, 56*, 708-713. doi: 10.1097/JOM.0000000000000191

Kavanaugh, K., Moore, J., Hibbett, L., & Kaczynski, A. (2015). Correlates of subjectively and objectively measured physical activity in young adolescents. *Journal of Sport and Health Science, 4*, 222-227. doi: 10.1016/j.jshs.2014.03.015

Keller, A., Igic, I., Meier, L., Semmer, N., Schaubroeck, J., Brunner, B., & Elfering, A. (2016, April 25). Testing job typologies and identifying at-risk subpopulations using factor mixture models. *Journal of Occupational Health Psychology*. Advance online publication. doi: 10.1037/ocp0000038

Kemple, M., O'Toole, S., & O'Toole, C. (2016). Sleep quality in patients with chronic illness. *Journal of Clinical Nursing, 25*, 3363-3372. doi: 10.1111/jocn.13462

Kessler, R., Ames, M., Hymel, P., Loeppke, R., McKenas, D., Richling, D., Stang, P., & Ustun, T. (2004). Using the WHO health and work performance questionnaire (HPQ) to evaluate the indirect workplace costs of illness. *Journal of Occupational and Environmental Medicine, 46*, S23-S37. doi: 10.1097/01.jom.0000126683.75201.c5

Kessler, R., Barber, C., Beck, A., Berglund, P., Cleary, P., McKenas, D., Pronk, N., Simon, G., Stang, P., Ustun, T., & Wang, P. (2003). The World Health Organization health and work performance

questionnaire (HPQ). *Journal of Occupational and Environmental Medicine, 45*, 156-174. Retrieved from https://www.ncbi.nlm.nih.gov/

Khamisa, N., Oldenburg, B., Peltzer, K., & Ilic, D. (2015). Work related stress, burnout, job satisfaction and general health of nurses. *International Journal of Environmental Research and Public Health, 12*, 652-666. doi: 10.3390/ijerph120100652

Khaw, K., Wareham, N., Bingham, S., Welch, A., Luben, R., & Day, N. (2008). Combined impact of health behaviours and mortality in men and women: the EPIC-Norfolk prospective population study. *PLOS Medicine, 5*, e70. doi: 10.1371/journal.pmed.0050012.t001

Kilpatrick, M., Blizzard, L., Sanderson, K., Teale, B., Jose, K., & Venn, A. (2017). Barriers and facilitators to participation in workplace health promotion (WHP) activities: Results from a cross-sectional survey of public sector employees in Tasmania, Australia. *Health Promotion Journal of Australia*. Advance online publication. doi: 10.1071/HE16052

Kim, E., Kubzansky, L., Soo, J., & Boehm, J. (2017). Maintaining healthy behavior: A prospective study of psychological well-being and physical activity. *Annals of Behavioral Medicine, 51*, 337-347. doi: 10.1007/s12160-016-9856-y

Kirk, M., & Rhodes, R. (2012). Physical activity status of academic professors during their early career transition: An application of the theory of planned behavior. *Psychology, Health & Medicine, 17*, 551-564. doi: 10.1080/13548506.2011.647700

Kirsten, W. (2010). Making the link between health and productivity at the workplace – a global perspective. *Industrial Health, 48*, 251-255. doi: 10.2486/indhealth.48.251

Kish, L. (1965). *Survey sampling*. New York, NY: Wiley. doi: 10.1002/bimj.19680100122

Kitaoka-Higashiguchi, K., Nakagawa, H., Morikawa, Y., Ishizaki, M., Miura, K., Naruse, Y., … Higashiyama, M. (2004). Construct validity of the Maslach burnout inventory – general survey. *Stress & Health, 20*, 255-260. doi: 10.1002/smi.1030

Knudsen, H., Ducharme, L., & Roman, P. (2007). Job stress and poor sleep quality: Data from an American sample of full-time workers. *Social Science & Medicine, 64*, 1997-2007. doi: 10.1016/j.socscimed.2007.02.020

Kodama, S., Tanaka, S., Heianza, Y., Fujihara, K., Horikawa, C., Shimano, H., … Sone, H. (2013). Association between physical activity and risk of all-cause mortality and cardiovascular disease in patients with diabetes: A meta-analysis. *Diabetes Care, 36*, 471-479. doi: 10.2337/dc12-0783

Kompier, M. (2005). Assessing the psychosocial work environment – "subjective" versus "objective" measurement. *Scandinavian Journal of Work, Environment & Health, 31*, 405-408. Retrieved from https://www.ncbi.nlm.nih.gov/

Kowalski, T., & Loretto, W. (2017). Well-being and HRM in the changing workplace. *The International Journal of Human Resource Management, 28*, 2229-2255. doi: 10.1080/09585192.2017.1345205

Kriston, L., Holzel, L., Weiser, A., Berner, M., & Harter, M. (2008). Meta-analysis: Are 3 questions enough to detect unhealthy alcohol use? *Annals of Internal Medicine, 149*, 879-888. doi: 10.7326/0003-4819-149-12-200812160-00007

Kriston, L., Holzel, L., Weiser, A., Berner, M., & Harter, M. (2008). Meta-analysis: Are 3 questions enough to detect unhealthy alcohol use? *Annals of Internal Medicine, 149*, 879-888. doi: 10.7326/0003-4819-149-12-200812160-00007

Kuhnle, G. (2012). Nutritional biomarkers for objective dietary assessment. *Journal of the Science of Food and Agriculture, 92*, 1145-1149. doi: 10.1002/jsfa.5631

Kuoppala, J., Lamminpaa, A., & Husman, P. (2008). Work health promotion, job well-being, and sickness absences – a systematic review and meta-analysis. *Journal of Occupational and Environmental Medicine, 50*, 1216-1227. doi: 10.1097/JOM.0b013e31818dbf92

Kuykendall, L., & Tay, L. (2015). Employee subjective well-being and physiological functioning: An integrative model. *Health Psychology Open, 2*, 1-11. doi: 10.1177/2055102915592090

Laguna, M., Razmus, W., & Żaliński, A. (2017). Dynamic relationships between personal resources and work engagement in entrepreneurs. *Journal of Occupational and Organizational Psychology, 90*, 248-269. doi: 10.1111/joop.12170

Lance, C., Butts, M., & Michels, L. (2006). The sources of four commonly reported cutoff criteria. *Organizational Research Methods, 9*, 202-220. doi: 10.1177/1094428105284919

Lanza S., Tan X., & Bray, B. (2013). Latent class analysis with distal outcomes: A flexible model-based approach. *Structural Equation Modeling, 20*, 1-26. doi: 10.1080/10705511.2013.742377

Lash, T., Fox, M., & Fink, A. (2009). *Applying quantitative bias in epidemiologic data*. New York: Springer.

LeCheminant, J., Merrill, R., & Masterson, T. (2015). Health behaviours and work-related outcomes among school employees. *American Journal of Health Behaviour, 39*, 345-351. doi: 10.5993/AJHB.39.3.7

Lee, I. (2003). Physical activity and cancer prevention – data from epidemiologic studies. *Medicine and Science in Sports and Exercise, 35*, 1823-1827. doi: 10.1249/01.MSS.0000093620.27893.23

Lee, I., Shiroma, E., Lobelo, F., Puska, P., Blair, S., Katzmarzyk, P., & Lancet Physical Activity Series Working Group. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *Lancet, 380*, 219-229. doi: 10.1016/S0140-6736(12)61031-9

Lee, P., Macfarlane, D., & Stewart, S. (2011). Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 8*, 1-11. doi: 10.1186/1479-5868-8-115

Leger, D., Poursain, B., Neubauer, D., & Uchiyama, M. (2008). An international survey of sleeping problems in the general population. *Current Medical Research and Opinion, 24*, 307-317. doi: 10.1185/030079907X253771

Leigh, B. (1989). In search of the seven dwarves: Issues of measurement and meaning in alcohol expectancy research. *Psychological Bulletin, 105*, 361-373. doi: 10.1037/0033-2909.105.3.361

Leijten, F., Van Den Heuvel, S., Van Der Beek, A., Ybema, J., Robroek, S., & Burdof, A. (2015). Associations of work-related factors and work engagement with mental and physical health: A 1-year follow-up study among older workers. *Journal of Occupational Rehabilitation,*

León-Pérez, J., Antino, M., & León-Rubio, J. (2016). Adaptation of the short version of the psychological capital questionnaire (pcq-12) into Spanish. *International Journal of Social Psychology, 32*, 196-213. doi: 10.1080/02134748.2016.1248024

LePine, J., Podsakoff, N., & LePine, M. (2005). A meta-analytic test of the challenge stressor – hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal, 48*, 764-775. doi: 10.5465/AMJ.2005.18803921

Li, J., Yang, W., Liu, P., Xu, Z., & Cho, S. (2004). Psychometric evaluation of the Chinese (mainland) version of the job content questionnaire: A study in university hospitals. *Industrial Health, 42*, 260-267. doi: 10.2486/indhealth.42.260

Lin, Y., McCullagh, M., Kao, T., & Larson, J. (2014). An integrative review: Work environment and factors associated with physical activity among white-collar workers. *Western Journal of Nursing Research, 36*, 262-283. doi:

Lindell, M., & Whitney, D. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology, 86*, 114-121. doi: 10.1037//0021-9010.86.1.114

Litwiller, B., Snyder, A., Taylor, D., & Steele, M. (2017). The relationship between sleep and work: A meta-analysis. *Journal of Applied Psychology, 102*, 682-699. doi: 10.1037/apl0000169

Liu, S., Eaton, C., Driban, J., McAlindon, T., & Lapane, K. (2016). Comparison of self-report and objective measures of physical activity in US adults with osteoarthritis. *Rheumatology International, 36*, 1355-1364. doi: 10.1007/s00296-016-3537-9

Liu, Y., Croft, J., Wheaton, A., Perry, G., Chapman, D., Strine, T., …Presley-Cantrell, L. (2013). Association between perceived insufficient sleep, frequent mental distress, obesity and chronic diseases among US adults, 2009 behavioral risk factor surveillance system. *BMC Public Health, 13*, 84. doi: 10.1186/1471-2458-13-84

Liu, Y., Song, Y., Koopmann, J., Wang, M., Chang, C., & Shi, J. (2017). Eating your feelings? Testing a model of employees' work-related stressors, sleep quality, and unhealthy eating. *Journal of Applied Psychology, 102*, 1237-1258. doi: 10.1037/apl0000209

Liu, Y., Wheaton, A., Chapman, D., & Croft, J. (2013). Sleep duration and chronic diseases among US adults age 45 years and older: Evidence from the 2010 behavioral risk factor surveillance system. *Sleep, 36*, 1421-1427. doi: 10.5665/sleep.3028

Loft, M., & Cameron, L. (2014). The importance of sleep: Relationships between sleep quality and work demands, the prioritization of sleep and pre-sleep arousal in day-time employees. *Work & Stress, 28*, 289-304. doi: 10.1080/02678373.2014.935523

Lorente, L., Salanova, M., Martinez, I., & Schaufeli, W. (2008). Extension of the job demands-resources model in the prediction of burnout and engagement among teachers over time. *Psicothema, 20*, 354-360. Retrieved from https://www.ncbi.nlm.nih.gov/

Lorente, L., Salanova, M., Martínez, I., & Vera, M. (2014). How personal resources predict work engagement and self-rated performance among construction workers: A social cognitive perspective. *International Journal of Psychology, 49*, 200-207. 10.1002/ijop.12049

Lourenço, S., Carnide, F., Benavides, F., & Lucas, R. (2015). Psychosocial Work Environment and Musculoskeletal Symptoms among 21-Year-Old Workers: A Population-Based Investigation (2011-2013). *PLoS ONE, 10*, e0130010. doi: 10.1371/journal.pone.0130010

Lubke H., & Neale C. (2006). Distinguishing between latent classes and continuous factors: Resolution by maximum likelihood. *Multivariate Behavioral Research, 41*, 499–532. doi: 10.1080/00273170802490673

Luthans, F., Avolio, B., Avey, J., & Norman, S. (2007). Psychological capital: Measurement and relationship with performance and job satisfaction. *Personnel Psychology, 60*, 541-572. doi: 10.1111/j.1744-6570.2007.00083.x

Luthans, F., Youssef, C., & Avolio, B. (2006). *Psychological capital: Developing the human competitive edge*. Retrieved from http://www.ebrary.com

Luthans, F., Youssef, C., & Avolio, B. (2007). *Psychological capital*. New York, NY: Oxford University Press.

Lynch, A., Coley, R., Sims, J., Lombardi, C., & Mahalik, J. (2015). Direct and interactive effects of parent, friend and schoolmate drinking on alcohol use trajectories. *Psychology & Health, 30*, 1183–1205. doi: 10.1080/08870446.2015.1040017

Macey, W., & Schneider, B. (2008). The meaning of employee engagement. *Industrial and Organizational Psychology, 1*, 3–30. doi: 10.1111/j.1754-9434.2007.0002.x

Mäkelä, L., Bergbom, B., Tanskanen, J., & Kinnunen, U. (2014). The relationship between international business travel and sleep problems via work-family conflict. *Career Development International, 19*, 794-812. doi: 10.1108/CDI-04-2014-0048

Malik, S., Blake, H., & Suggs, L. (2014). A systematic review of workplace health promotion interventions for increasing physical activity. *British Journal of Health Psychology, 19*, 149-180. doi: 10.1108/CGIJ.24819baa.006

Marsh, H. W., Hau, K.-T., & Grayson, D. (2005). Goodness of fit evaluation in structural equation modeling. In A. Maydeu-Olivares & J. McArdle (Eds.), *Psychometrics. A Festschrift for Roderick P. McDonald* (pp. 275-340). Hillsdale, NJ: Erlbaum. Retrieved from https://books.google.com.au/

Marsh, H., Lüdtke, O., Trautwein, U., & Morin, A. (2009). Classical latent profile analysis of academic self-concept dimensions: Synergy of person- and variable-centered approaches to theoretical models of self-concept. *Structural Equation Modeling, 16*, 191-225. doi: 10.1080/10705510902751010

Maslach, C., & Jackson, S. (1986). *Maslach Burnout Inventory Manual (2nd ed.)*. Mountain View, CA: CPP, Inc.

Maslach, C., Jackson, S., & Leiter, M. (1996). *Maslach Burnout Inventory Manual (3rd ed.)*. Retrieved from http://www.mindgarden.com/

Maslach, C., Schaufeli, W., & Leiter, M. (2001). Job burnout. *Annual Review of Psychology, 52*, 397-422. doi: 10.1146/annurev.psych.52.1.397

Mastenbroek, N., Jaarsma, A., Scherpbier, A., Van Beukelen, P., & Demerouti, E. (2011). The role of personal resources in explaining well-being and performance: A study among young veterinary professionals. *European Journal of Work and Organizational Psychology, 23*, 190-202. doi: 10.1080/1359432X.2012.728040

Mayerl, H., Stolz, E., Großschädl, F., Rásky, É., & Freidl, W. (2017). The moderating role of personal resources in the relationship between psychosocial job demands and health: A cross-sectional study. *BMJ Open, 7*, e015710. doi: 10.1136/bmjopen-2016-015710

McCarthy, V., Perry, I., Harrington, J., & Greiner, B. (2015). Co-occurrence of protective health behaviours and perceived psychosocial job characteristics. *Preventive Medicine Reports, 2*, 812-817. doi: 10.1016/j.pmedr.2015.09.012

McCarthy, V., Wills, T., & Crowley, S. (2018). Nurses, age, job demands and physical activity at work and at leisure: A cross-sectional study. *Applied Nursing Research, 40*, 116-121. doi: 10.1016/j.apnr.2018.01.010

McDougall, L., & Drummond, P. (2010). Personal resources moderate the relationship between work stress and psychological strain of submariners. *Military Psychology, 22*, 385-398. doi: 10.1080/08995605.2010.513231

McEwen, B. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine, 338*, 171-179. doi: 10.1056/NEJM199801153380307

McGregor, A., Magee, C., Caputi, P., & Iverson, D. (2016). A job demands-resources approach to presenteeism. *Career Development International, 21*, 402-418. doi: 10.1108/CDI-01-2016-0002

Meader, N., King, K., Wright, K., Graham, H., Petticrew, M., Power, C., … Sowden, A. (2017). Multiple risk behavior interventions: Meta-analyses of RCTs. *American Journal of Preventive Medicine, 53*, e19-e30. doi: 10.1016/j.amepre.2017.01.032

Melamed, S. (2009). Burnout and risk of regional musculoskeletal pain: A prospective study of apparently healthy employed adults. *Stress and Health, 25*, 313-321. doi: 10.1002/smi.1265

Melamed, S., Shirom, A., Toker, S., & Shapira, I. (2006). Burnout and risk of type 2 diabetes: A prospective study of apparently healthy employed persons. *Psychosomatic Medicine, 68*, 863-869. doi: 10.1097/01.psy.0000242860.24009.f0

Melamed, S., Shirom, A., Toker, S., Berliner, S., & Shapira, I. (2006). Burnout and risk of cardiovascular disease: Evidence, possible causal paths, and promising research directions. *Psychological Bulletin, 132*, 327-353. doi: 10.1037/0033–2909.132.3.327

Meyer, J., & Morin, A. (2016). A person-centered approach to commitment research: Theory, research, and methodology. *Journal of Organizational Behavior, 37*, 584–612. doi: 10.1002/job.2085

Miller, T., Abdel-Maksoud, M., Crane, L., Marcus, A., & Byers, T. (2008). Effects of social approval bias on self-reported fruit and vegetable consumption: A randomized controlled trial. *Nutrition Journal, 7*, 18. doi: 10.1186/1475-2891-7-18

Mohamed, S., Al-Ibrahim, S., & Gross, J. (1990). Tobacco use. In Walker, H., Hall, W., & Hurst, J. (Eds.). *Clinical methods: The history, physical and laboratory examinations. 3rd edition* (pp. 214-216). Retrieved from https://www.ncbi.nlm.nih.gov/

Mohan, J., Xiaofan, G., & Yingxian, S. (2017). Association between sleep time and depression: A cross-sectional study from countries in rural Northeastern China. *Journal of International Medical Research, 45*, 984-992. doi: 10.1177/0300060517701034

Molina, A., Fernandez, D., Delgado, M., & Martin, V. (2010). Sensitivity and specificity of a self-administered questionnaire of tobacco use; including the Fagerstrom test. *International Journal of Nursing Studies, 47*, 181-189. doi: 10.1016/j.ijnurstu.2009.05.022

Morin, A., Maïano, C., Nagengast, B., Marsh, W., Morizot, J., & Janosz, M. (2011). Growth mixture modeling of adolescents trajectories of anxiety across adolescence: The impact of untested invariance assumptions. *Structural Equation Modeling, 18*, 613–648. doi: 10.1080/10705511.2011.607714

Mouchacca, J., Abbott, G., & Ball, K. (2013). Associations between psychological stress, eating, physical activity, sedentary behaviours and body weight among women: A longitudinal study. *BMC Public Health, 13*, 828. doi: 10.1186/1471-2458-13-828

Moustou, I., Panagopoulou, E., Montgomery, A., & Benos, A. (2010). Burnout predicts health behaviors in ambulance workers. *The Open Occupational Health & Safety Journal, 2*, 16-18. doi: 10.2174/1876216601002010016

Müjdelen, Y., & Özgün, C. (2013). Using job resources and job demands in predicting burnout. *Procedia – Social and Behavioral Sciences, 99*, 869-876. doi: 10.1016/j.sbspro.2013.10.559

Munir, F., Houdmont, J., Clemes, S., Wilson, K., Kerr, R., & Addley, K. (2015). Work engagement and its association with occupational sitting time: Results from the Stormont study. *BMC Public Health, 15*, 30. doi: 10.1186/s12889-015-1427-9

Muthén, B., & Satorra, A. (1995). Complex sample data in structural equation modeling. In P. V. Marsden (Ed.), *Sociological methodology* (pp. 267–316). Oxford, England: Blackwell. Retrieved from https://books.google.com.au/

Muthén, L., & Muthén, B. (1998-2015). *Mplus users guide* (7th ed.). Los Angeles CA: Muthén & Muthén.

Nägel, I., & Sonnentag, S. (2013). Exercise and sleep predict personal resources in employees' daily lives. *Applied Psychology: Health and Well-Being, 5*, 348-368. doi: 10.1111/aphw.12014

Nagler, E., Viswanath, K., Ebbeling, C., Stoddard, A., & Sorensen, C. (2013). Correlates of fruit and vegetable consumption among construction laborers and motor freight workers. *Cancer Causes Control, 24*, 637-647. doi: 10.1007/s10552-012-9998-6

Nancarrow, S. (2013). Barriers to the routine collection of health outcome data in an Australian community care organization. *Journal of Multidisciplinary Healthcare, 6*, 1-16. doi: 10.2147/JMDH.S37727

National Health and Medical Research Council. (2016). *Major health issues.* Retrieved from https://www.nhmrc.gov.au

Neckel, S., Schaffner, A., & Wagner, G. (2017). *Burnout, fatigue, exhaustion: An interdisciplinary perspective on a modern affliction.* doi: 10.1007/978-3-319-52887-8

Nerstad, C., Richardsen, A., & Martinussen, M. (2009). Factorial validity of the Utrecht work engagement scale (UWES) across occupational groups in Norway. *Scandinavian Journal of Psychology, 51*, 326-333. doi: 10.1111/j.1467-9450.2009.00770.x

Nevanperä, N., Hopsu, L., Kuosma, E., Ukkola, O., Uitti, J., & Laitinen, J. (2012). Occupational burnout, eating behaviour, and weight among working women. *The American Journal of Clinical Nutrition, 95*, 934-943. doi: ajcn.111.014191

Niedhammer, I., & Chea, M. (2003). Psychosocial factors at work and self reported health: Comparative results of cross sectional and prospective analyses of the French GAZEL cohort. *Occupational and Environmental Medicine, 60*, 509-515. doi: 10.1136/oem.60.7.509

Nielsen, M., Finne, L., Christensen, J., & Knardahl, S. (2015). Job demands and alcohol use: Testing a moderated mediation model. *Scandinavian Journal of Work, Environment & Health, 41*, 43-53. doi: 10.5271/sjweh.3455

Nishi, D., Suzuki, Y., Nishida, J., Mishima, K., & Yamanouchi, Y. (2017). Personal lifestyle as a resource for work engagement. *Journal of Occupational Health, 59*, 17-23. doi: 10.1539/joh.16-0167-OA

Nixon, A., Mazzola, J., Bauer, J., Krueger, J., & Spector, P. (2011). Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. *Work & Stress, 25*, 1-22. doi: 10.1080/02678373.2011.569175

Nordin, M., Westerholm, P., Alfredson, L., & Åkerstedt, T. (2012). Social support and sleep. Longitudinal relationships from the WOLF-Study. *Psychology, 3*, 1223-1230. doi: 10.4236/psych.2012.312A181

Nyce, S., Grossmeier, J., Anderson, D., Terry, P., & Kelley, B. (2012). Association between changes in health risk status and changes in future health care costs: A multiemployer study. *Journal of Occupational and Environmental Medicine, 54*, 1364-1373. doi: 0.1097/JOM.0b013e31826b4996

Nylund K, Asparouhov T, & Muthén B. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling, 14*, 535–569. doi: 10.1080/10705510701575396

Ohly, S., Sonnentag, S., Niessen, C., & Zapf, D. (2010). Diary studies in organizational research: An introduction and some practical recommendations. *Journal of Personnel Psychology, 9*, 79-93. doi: 10.1027/1866-5888/a000009

Paulhus, D., & Vazire, S. (2007). The self-report method. In Robins R., Fraley R., & Kruger R. (Eds.). *Handbook of research methods in personality psychology* (pp. 224-239). doi: 10.1111/j.1744-6570.2008.01133_6.x

Pavey, T., Gomersall, S., Clark, B., & Brown, W. (2016). The validity of the GENEActiv wrist-worn accelerometer for measuring adult sedentary time in free living. *Journal of Science and Medicine in Sport, 19*, 395-399. doi: 10.1016/j.jsams.2015.04.007

Pawson, R. (2002). Evidence-based policy: In search of a method. *Evaluation, 8*, 157-181. doi: 10.1177/1358902002008002512

Payne, N., Jones, F., & Harris, P. (2005). The impact of job strain on the predictive validity of the theory of planned behaviour: An investigation of exercise and healthy eating. *British Journal of Health Psychology, 10*, 115-131. doi: 10.1348/135910704X14636

Payne, N., Jones, F., & Harris, P. (2010). A daily diary investigation of the effects of work stress on exercise intention implementation: Can planning overcome the disruptive effects of work? *Psychology and Health, 25*, 111-129. doi: 10.1080/08870440903337622

Payne, N., Jones, F., & Harris, P. (2012). Employees' perceptions of the impact of work on health behaviours. *Journal of Health Psychology, 18*, 887-899. doi: 10.1177/1359105312446772

Peake, J., Gargett, S., Waller, M., McLaughlin, R., Cosgrove, T., Wittert, G., … Warfe, P. (2012). The health and cost implications of high body mass index in Australian defence force personnel. *BMC Public Health, 12*, 451. doi: 10.1186/1471-2458-12-451

Pedersen, M., Blangsted, A., Andersen, L., Jørgensen, M., Hansen, E., & Sjøgaard, G. (2009). The effect of worksite physical activity intervention on physical capacity, health, and productivity: A 1-year randomized controlled trial. *Journal of Occupational and Environmental Medicine, 51*, 759-770. doi: 10.1097/JOM.0b013e3181a8663a

Penz, M., Stalder, T., Miller, R., Ludwig, V., Kanthak, M., & Kirschbaum, C. (2018). Hair cortisol as a biological marker for burnout symptomatology. *Psychoneuroendocrinology, 87*, 218-221. doi: 10.1016/j.psyneuen.2017.07.485

Peretti-Watel, P., Constance, J., Seror, V., & Beck, F. (2009). Working conditions, job satisfaction and smoking behaviours among French clerks and manual workers. *Journal of Occupational and Environmental Medicine, 51*, 343-350. doi: 10.1097/JOM.0b013e31819464fe

Pescud, M., Teal, R., Shilton, T., Slevin, T., Ledger, M., Waterworth, P., & Rosenberg, M. (2015). Employers' views on the promotion of workplace health and wellbeing: A qualitative study. *BMC Public Health, 15*, 642. doi: 10.1186/s12889-015-2029-2

Pescud, M., Waterworth, P., Shilton, T., Teal, R., Slevin, T., Ledger, M., … Rosenberg, M. (2016). A healthier workplace? Implementation of fruit boxes in the workplace. *Health Education Journal, 75,* 843-854. doi: 10.1177/0017896916629817

Peterson, J., Pearce, P., Ferguson, L., & Langford, C. (2017). Understanding scoping reviews: Definition, purpose, and process. *Journal of the American Association of Nurse Practitioners, 29,* 12-doi: 16. 10.1002/2327-6924.12380

Peterson, U., Demerouti, E., Bergstrom, G., Samuelsson, M., Asberg, M., & Nygren, A. (2008). Burnout and physical and mental health among Swedish healthcare workers. *Journal of Advanced Nursing, 62,* 84-95. doi: 10.1111/j.1365-2648.2007.04580.x

Peto, J. (2011). Cancer epidemiology in the last century and the next decade. *Nature, 411,* 390-395. doi: 10.1038/35077256

Pham, M., Rajić, A., Greig, J., Sargeant, J., Papadopoulos, A., & McEwen, S. (2014). A scoping review of scoping reviews: Advancing the approach and enhancing the consistency. *Research Synthesis Methods, 5,* 371-385. doi: 10.1002/jrsm.1123

Podsakoff, P., MacKenzie, S., & Jeong-Yeon, L. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88,* 879-903. doi: 10.1037/0021-9010.88.5.879

Preacher, K., Zhang, Z., & Zyphur, M. (2011). Alternative methods for assessing mediation in multilevel data: The advantages of multilevel SEM. *Structural Equation Modelling, 18,* 161-182. doi:10.1080/10705511.2011.557329

Preacher, K., Zyphur, M., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15,* 209-233. doi:10.1037/a0020141

Price, B. (2016). Promoting healthy sleep. *Nursing Standard, 30,* 49-58. 10.7748/ns.30.28.49.s48

Prince, S., Adamo, K., Hamel, M., Hardt, J., Gorber, S., & Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 5,* 56. doi: 10.1186/1479-5868-5-56

Puetz, T., O'Connor, P., & Dishman, R. (2006). Effects of chronic exercise on feelings of energy and fatigue: A quantitative synthesis. *Psychological Bulletin, 132,* 866-876. doi: 10.1037/0033-2909.132.6.866

Ratnavadivel, R., Chau, N., Stadler, D., Yeo, A., McEvoy, D., & Catcheside, P. (2009). Marked reduction in obstructive sleep apnea severity in slow wave sleep. *Journal of Clinical Sleep Medicine, 15,* 519-524. Retrieved from https://www.researchgate.net/

Redman, T., Snape, E., & Ashurst, C. (2009). Location, location, location: Does place of work really matter? *British Journal of Management, 20,* S171-S181. doi: 10.1111/j.1467-8551.2008.00640.x

Reed, J., & Buck, S. (2009). The effect of regular aerobic exercise on positive-activated affect: A meta-analysis. *Psychology of Sport and Exercise, 10,* 581-594. doi: 10.1016/j.psychsport.2009.05.009

Reed, J., & Ones, D. (2006). The effect of acute aerobic exercise on positive activated affect: A meta-analysis. *Psychology of Sport and Exercise, 7,* 477-514. doi: 10.1016/j.psychsport.2005.11.003

Reiner, M., Niermann, C., Jekauc, D., & Woll, A. (2013). Long-term health benefits of physical activity – a systematic review of longitudinal studies. *BMC Public Health, 13,* 813. doi: 10.1186/1471-2458-13-813

Reinert, D., & Allen, J. (2007). The alcohol use disorders identification test: An update of research findings. Alcoholism: Clinical and Experimental Research, 31, 185-199. doi: 10.1111/j.1530-0277.2006.00295.x

Reis, H., & Gable, S. (2000). Event-sampling and other methods for studying everyday experience. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 190-222). doi: 10.1017/CBO9780511996481

Reynolds, K., Lewis, L., Nolen, J., Kinney, G., Sathya, B., & He, J. (2003). Alcohol consumption and risk of stroke: A meta-analysis. *Journal of the American Medical Association, 289*, 579-588. doi: 10.1001/jama.289.5.579

Richardsen, A., & Martinussen, M. (2005). Factorial validity and consistency of the MBI-GS across occupational groups in Norway. *International Journal of Stress Management, 12*, 289-297. doi: 10.1037/1072-5245.12.3.289

Rodell, J., & Judge, T. (2009). Can 'good' stressors spark 'bad' behaviors? The mediating role of emotions in links of challenge and hindrance stressors with citizenship and counterproductive behaviors. *Journal of Applied Psychology, 94*, 1438-1451. doi: 10.1037/a0016752

Rongen, A., Robroek, S., Schaufeli, W., & Burdorf, A. (2014). The contribution of work engagement to self-perceived health, work ability, and sickness absence beyond health behaviors and work-related factors. *Journal of Occupational and Environmental Medicine, 56*, 892-897. doi: 10.1097/JOM.0000000000000196

Ronksley, P., Brien, S., Turner, B., Mukamal, K., & Ghali, W. (2011). Association of alcohol consumption with selected cardiovascular disease outcomes: A systematic review and meta-analysis. *British Medical Journal, 342*, d671. doi: 10.1136/bmj.d671

Roscoe, C., James, R., & Duncan, M. (2017). Calibration of GENEActiv accelerometer wrist cut-points for the assessment of physical activity intensity of preschool aged children. *European Journal of Pediatrics, 176*, 1093-1098. doi: 10.1007/s00431-017-2948-2

Rostron, B. (2012). Alcohol consumption and mortality risks in the USA. *Alcohol and Alcoholism, 47*, 334-339. doi: 10.1093/alcalc/agr171

Saint Onge, J., & Krueger, P. (2017). Health lifestyle behaviors among U.S. adults. *SSM – Population Health, 3*, 89-98. doi: 10.1016/j.ssmph.2016.12.009

Salanova, M., Líbano, D., Llorens, S., & Schaufeli, W. (2014). Engaged, workaholic, burned-out or just 9-to-5? Toward a typology of employee well-being. *Stress & Health, 30*, 71-81. doi: 10.1002/smi.2499

Salgado-García, F., Zuber, J., Graney, M., Nichols, L., Martindale-Adams, J., & Andrasik, F. (2015). Smoking and smoking increase in caregivers of Alzheimer's patients. *The Gerontologist, 55*, 780-792. doi: 10.1093/geront/gnt149

Schaufeli, W. (2017). Applying the job demands-resources model: A 'how to' guide to measuring and tackling work engagement and burnout. *Organizational Dynamics, 46*, 120-132. doi: 10.1016/j.orgdyn.2017.04.008

Schaufeli, W. & Bakker, A. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behaviour, 25*, 293-315. doi: 10.1002/job.248

Schaufeli, W., & Salanova, M. (2007). Work engagement: An emerging psychological concept and its implications for organizations. In S. W. Gilliland, D. D. Steiner, & D. P. Skarlicki (Eds.), *Research in*

social issues in management: Vol. 5. Managing social and ethical issues in organizations. Greenwich, CT: Information Age Publishers.

Schaufeli, W., & Taris, T. (2014). A critical review of the job demands-resources model: Implications for improving work and health. In G. Bauer & O. Hammig (Eds.), *Bridging Occupational, Organizational and Public Health: A Transdisciplinary Approach*. doi: 10.1007/978-94-007-5640-3_4,

Schaufeli, W., Bakker, A., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire. *Educational and Psychological Measurement, 66*, 701-716. doi: 10.1177/0013164405282471

Schaufeli, W., Bakker, A., & Van Rhenen, W. (2009). How changes in job demands and resources predict burnout, work engagement and sickness absenteeism. *Journal of Organizational Behavior, 30*, 893-917. doi: 10.1002/job.595

Schaufeli, W., Salanova, M., González-Romá, V., & Bakker, A. (2002). The measurement of engagement and burnout: A confirmative analytic approach. *Journal of Happiness Studies, 3*, 71-92. doi: 10.1023/A:1015630930326

Schmidt, K., & Diestel, S. (2013). Job demands and personal resources in their relations to indicators of job strain among nurses for older people. *Journal of Advanced Nursing, 69*, 2185-2195. doi: 10.1111/jan.12082

Schmitt, A., Ohly, S., & Kleepsies, N. (2015). Time pressure promotes work engagement: Test of illegitimate tasks as a boundary condition. *Journal of Personnel Psychology, 14*, 28-36. doi: 10.1027/1866-5888/a000119

Schneider, B., & Schneider, U. (2012). Health behaviour and health assessment: Evidence from German microdata. *Economics Research International, 135630*. doi: 10.1155/2012/135630

Schneider, D., Winter, V., & Schreyögg, J. (2017, March 3). Job demands, job resources, and behavior in times of sickness: An analysis across German nursing homes. *Health Care Management Review*. Advance online publication. doi: 10.1097/HMR.0000000000000157

Scholz, U., Schüz, B., Ziegelmann, J., Lippke, S., & Schwarzer, R. (2008). Beyond behavioral intentions: Planning mediates between intentions and physical activity. *British Journal of Health Psychology, 13*, 479-494. doi: 10.1348/135910707X216062

Schonfeld, I., & Chang, C. (2017). *Occupational health psychology: Work, stress, and health.* doi: 10.1002/9780470661550

Schopp, L., Bike, D., Clark, M., & Minor, M. (2015). Act healthy: Promoting health behaviors and self-efficacy in the workplace. *Health Education Research, 30*, 542-553. doi: 10.1093/her/cyv024

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology, 57*, 1-29. doi: 10.1111/j.1464-0597.2007.00325.x

Schwarzer, R., Schüz, B., Ziegelmann, J., Lippke, S., Luszczynska, A., & Scholz, U. (2007). Adoption and maintenance of four health behaviors: Theory-guided longitudinal studies on dental flossing, seat belt use, dietary behavior, and physical activity. *Annals of Behavioral Medicine, 33*, 156-166. doi: 10.1007/BF02879897

Sedgwick, P. (2014). Cross-sectional studies: Advantages and disadvantages. *BMJ, 348*, g2276. doi: 10.1136/bmj.g2276

Seppälä, P., Mauno, S., Feldt, T., Hakanen, J., Kinnunen, U., Tolvanen, A., & Schaufeli, W. (2009). The construct validity of the Utrecht work engagement scale: Multisample and longitudinal evidence. *Journal of Happiness Studies, 10,* 459-481. doi: 10.1007/s10902-008-9100-y

Seppälä, P., Mauno, S., Kinnunen, M., Feldt, T., Juuti, T., Tolvanen, A., & Rusko, H. (2011). Is work engagement related to healthy cardiac autonomic activity? Evidence from a field study among Finnish women workers. *The Journal of Positive Psychology, 7,* 95-106. doi: 10.1080/17439760.2011.637342

Sera, F., Griffiths, L., Dezateux, C., Geraci, M., & Cortina-Borja, M. (2017). Using functional data analysis to understand daily activity levels and patterns in primary school-aged children: Cross-sectional analysis of a UK-wide study. *PLoS One, 12,* e0187677. doi: 10.1371/journal.pone.0187677

Serdula, M., Gillespie, C., Kettel-Khan, L., Farris, R., Seymour, J., & Denny, C. (2004). Trends in fruit and vegetable consumption among adults in the United States: Behavioral risk factor surveillance system, 1994-2000. *American Journal of Public Health, 94,* 1014-1018. Retrieved from https://www.ncbi.nlm.nih.gov/

Sharon, T., & Michal, B. (2012). Job burnout and depression: Unraveling their temporal relationship and considering the role of physical activity. *Journal of Applied Psychology, 97,* 699-710. doi: 10.1037/a0026914

Shi, Y., Sears, L., Coberley, C., & Pope, J. (2013). The association between modifiable well-being risks and productivity: A longitudinal study in pooled employer sample. *Journal of Occupational and Environmental Medicine, 55,* 353-364. doi: 10.1097/JOM.0b013e3182851923

Shimanzu, A., Schaufeli, W., Kamiyama, K., Kawakami, N. (2015). Workaholism vs. work engagement: The two different predictors of future well-being and performance. *International Journal of Behavioral Medicine, 22,* 18-23. doi: 10.1007/s12529-014-9410-x

Shirom, A. (2010). Employee burnout and health: Current knowledge and future research paths. In J. Houdmont & S. Leka (Eds.), *Contemporary occupational health psychology: Global perspectives on research and practice* (pp. 59-76). doi: 10.1002/9780470661550.ch4

Shirom, A., Armon, G., Berliner, S., Shapira, I. & Melamed, S. (2009). The effects of job strain on risk factors for cardiovascular disease. In C. Cooper, J. Quick, & M. Schabracq (Eds.), International handbook of work and health psychology. doi: 10.1002/9780470682357.ch4

Siergist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology, 1,* 27-41. doi: 10.1037/1076-8998.1.1.27

Simbula, S. (2010). Daily fluctuations in teachers' well-being: A diary study using the job demands-resources model. *Anxiety, Stress & Coping, 23,* 563-584. doi: 10.1080/10615801003728273

Sliwinski, M. (2008). Measurement-burst designs for social health research. *Social and Personality Psychology Compass, 2,* 245-261. doi: 10.1111/j.1751-9004.2007.00043.x

Smith, P., Frank, J., Mustard, C., & Bondy, S. (2008). Examining the relationships between job control and health status: A path analysis approach. *Journal of Epidemiology and Community Health, 62,* 54-61. doi: 10.1136/jech.2006.057539

Sniehotta, F. (2009). Towards a theory of intentional behaviour change: Plans, planning, and self-regulation. *British Journal of Health Psychology, 14,* 261-273. doi: 10.1348/135910708X389042

Söderström, M., Ekstedt, M., Åkerstedt, T., Nilsson, J., & Axelsson, J. (2004). Sleep and sleepiness in young individuals with high burnout scores. *Sleep, 27,* 1369-1377. doi: 10.1093/sleep/27.7.1369

Sofi, F., Capalbo, A., Cesari, F., Abbate, R., & Gensini, G. (2008). Physical activity during leisure time and primary prevention of coronary heart disease: An updated meta-analysis of cohort studies. *European Journal of Cardiovascular Prevention and Rehabilitation, 15*, 247-257. doi: 10.1097/HJR.0b013e3282f232ac

Soh, M., Zarola, A., Palaiou, K., & Furnham, A. (2016). Work-related well-being. *Health Psychology Open, 3*, 1-11. doi: 10.1177/2055102916628380

Sorensen, G., Landsbergis, P., Hammer, L., Amick, B., Linnan, L., Yancey, A., … Pratt, C. (2011). Preventing chronic disease in the workplace: A workshop report and recommendations. *American Journal of Public Health, 1*, 196-207. doi: 10.2105/AJPH.2010.300075

Sorensen, G., Stoddard, A., Dubowitz, T., Barbeau, E., Bigby, J., Emmons, K., … Peterson, K. (2007). The influence of social context on changes in fruit and vegetable consumption: Results of the healthy discretions studies. *American Journal of Public Health, 97*, 1216-1227. doi: 10.2105/AJPH.2006.088120

Spallek, M., Kuhn, W., Uibel, S., Van Mark, A., & Quarcoo, D. (2010). Work-related musculoskeletal disorders in the automotive industry due to repetitive work – implications for rehabilitation. *Journal of Occupational Medicine and Toxicology, 5*, 6. doi: 10.1186/1745-6673-5-6

Spector, P. (2006). Method variance in organizational research: Truth or urban legend? *Organizational Research Methods, 9*, 221-232. doi: 10.1177/1094428105284955

Standing, G. (2016). The Precariat: The new dangerous class (2011 reprint). Retrieved from https://ebookcentral.proquest.com

Stansfeld, S., & Candy, B. (2006). Psychosocial work environment and mental health – a meta-analytic review. *Scandinavian Journal of Work, Environment & Health, 32*, 443-462. doi: 10.5271/sjweh.1050

Stawski, R., MacDonald, S., & Sliwinski, M. (2015). *Measurement-burst designs*. In Guha, M. (Eds.). *The encyclopedia of adulthood and aging, 1st edition*. doi: 10.1002/9781118521373.wbeaa313

Steckler, A., & McLeroy, K. (2008). The importance of external validity. *American Journal of Public Health, 98*, 9-10. doi: 10.2105/AJPH.2007.126847

Stenfors, C., Magnusson Hanson, L., Oxenstierna, G., Theorell, R., & Nilsson, L. (2013). Psychosocial working conditions and cognitive complaints among Swedish employees. *PLoS One, 8*, e60637. doi: 10.1371/journal.pone.0060637

Steptoe, A., Lipsey, Z., & Wardle, J. (1998). Stress, hassles, and variations in alcohol consumption, food choice and physical exercise: A diary study. *British Journal of Health Psychology, 3*, 51-63. doi: 10.1111/j.2044-8287.1998.tb00555.x

Straker, L., Coenen, P., Dunstan, D., Gilson, N., & Healy, G. (2016). Sedentary work – evidence on emergent work health and safety issue. Retrieved from https://www.safeworkaustralia.gov.au/

Stranges, S., Tigbe, W., Gomez-Olive, F., Thorogood, M., & Kandala, N. (2012). Sleep problems: An emerging global epidemic? Findings from the INDEPTH WHO-SAGE study among more than 40,000 older adults from 8 countries across Africa and asia. *Sleep, 35*, 1173-1181. doi: 10.5665/sleep.2012

Stults-Kolehmainen, M., & Sinha, R. (2014). The effects of stress on physical activity and exercise. *Sports Medicine, 44*, 81-121. doi: 10.1007/s40279-013-0090-5

Sylvia, L., Bernstein, E., Hubbard, J., Keating, L., & Anderson, E. (2014). A practical guide to measuring physical activity. *Journal of the Academy of Nutrition and Dietetics, 114*, 199-208. doi: 10.1016/j.jand.2013.09.018

Tetrick, L., & Winslow, C. (2015). Workplace stress management interventions and health promotion. *Annual Review of Organizational Psychology and Organizational Behavior, 2*, 583-603. doi: 10.1146/annurev-orgpsych-032414-111341

Thøgersen-Ntoumani, C., Loughren, E., Kinnafick, F., Taylor, I., Duda, J. (2015). Changes in work affect in response to lunchtime walking in previously physically inactive employees: A randomized trial. *Scandinavian Journal of Medicine & Science in Sports, 25*, 778-787. doi: 10.1111/sms.12398

Toker, S., Melamed, S., Berliner, S., & Shapira, I. (2012). Burnout and risk of coronary heart disease. *Psychosomatic Medicine, 74*, 840-847. doi: 10.1097/PSY.0b013e31826c3174

Toker, S., Melamed, S., Berliner, S., Zeltser, D., & Shapira, I. (2012). Burnout and risk of coronary heart disease: A prospective study of 8838 employees. *Psychosomatic Medicine, 74*, 840-847. doi: 10.1097/PSY.0b013e31826c3174

Toppinen-Tanner, S., Ahola, K., Koskinen, A., & Vnnen, A. (2009). Burnout predicts hospitalization for mental and cardiovascular disorders: 10-year prospective results from industrial sector. *Stress and Health, 25*, 287-296. doi: 10.1002/smi.1282

Tremblay, M., & Messervey, D. (2011). The job demands-resources model: Further evidence for the buffering effect of personal resources. *SA Journal of Industrial Psychology, 37*, 10-19. doi: 10.4102/sajip.v37i2.876

Tremblay, M., Aubert, S., Barnes, J., Saunders, T., Carson, V., Latimer-Cheung, A., … SBRN Terminology Consensus Project Participants. (2017). Sedentary behavior research network (SBRN) – Terminology consensus project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity, 14*, 75. doi: 10.1186/s12966-017-0525-8

Tsutsumi, A., Kayaba, K., Yoshimura, M., Sawada, M., Ishikawa, S., Sakai, K., … Nago, N. (2003). Association between job characteristics and health behaviors in Japanese rural workers. *International Journal of Behavioral Medicine, 10*, 125-142. doi: 10.1207/S15327558IJBM1002_03

Urda, J., Larouere, B., Verba, S., & Lynn, J. (2017). Comparison of subjective and objective measures of office workers' sedentary time. *Preventive Medicine Reports, 8*, 163-168. doi: 10.1016/j.pmedr.2017.10.004

Van den Broeck, A., De Cuyper, N., De Witte, H., & Vansteenkiste, M. (2010). Not all job demands are equal: Differentiating job hindrances and job challenges in the job demands-resources model. *European Journal of Work and Organizational Psychology, 19*, 735-759. doi: 10.1080/13594320903223839

Van den Broeck, A., De Cuyper, N., Luyckx, K., & De Witte, H. (2011). Employees' job demands-resources profiles, burnout and work engagement: A person-centered examination. *Economic and Industrial Democracy, 33*, 691-706. doi: 10.1177/0143831X11428228

Van den Broeck, A., Van Ruysseveldt, J., Smulders, P., & De Witte, H. (2011). Does intrinsic value orientation strengthen the impact of job resources? A perspective from the job demands-resources model. *European Journal of Work and Organizational Psychology, 20*, 581-609. Retrieved from http://www.tandfonline.com/

Van Der Meij, L., Gubbels, N., Schaveling, J., Almela, M., & Van Vugt, M. (2018). Hair cortisol and work stress: Importance of workload and stress model (JDCS or ERI). *Psychoneuroendocrinology, 89*, 78-85. doi: 10.1016/j.psyneuen.2017.12.020

Van Poppel, M., Chinapaw, M., Mokkink, L., van Mechelen, W., & Terwee, C. (2010). Physical activity questionnaires for adults: A systematic review of measurement properties. *Sports Medicine, 40*, 565-600. doi: 10.2165/11531930-000000000-00000

Van Wingerden, Bakker, A., & Derks, D. (2015). A test of a job demands-resources intervention. *Journal of Managerial Psychology, 31*, 686-701. doi: 10.1108/JMP-03-2014-0086

Vink, J., Ouweneel, A., & Le Blanc, P. (2011). Psychologische energiebronnen voor bevlogen werknemers: Psychologisch kapitaal in het job demands-resources model. *Gedrag & Organisatie, 24,* 101–120. Retrieved from https://www.gedragenorganisatie.nl/

Walker, M. (2009). The role of sleep in cognition and emotion. *Annals of the New York Academy of Sciences, 1156*, 168-197. doi: 10.1111/j.1749-6632.2009.04416.x

Walker, T., Tullar, J., Diamond, P., Kohl III, H., & Amick III, B. (2017). The longitudinal relation between self-reported physical activity and presenteeism. *Preventive Medicine, 102*, 120-126. doi: 10.1016/j.ypmed.2017.07.003

Wang, M., & Hagnes, P. (2011). Latent class procedures: Applications to organizational research. *Organizational Research Methods, 14*, 24-31. doi: 10.1177/1094428110383988

Warburton, D., & Bredin, S. (2017). Health benefits of physical activity: A systematic review of systematic reviews. *Current Opinion in Cardiology, 32*, 541-556. doi: 10.1097/HCO.0000000000000437

Wernsing, T. (2014). Psychological capital: A test of measurement invariance across 12 national cultures. *Journal of Leadership & Organizational Studies, 21*, 179-190. doi: 10.1177/1548051813515924

White, R., Babic, M., Parker, P., Lubans, D., Astell-Burt, T., & Lonsdale, C. (2017). Domain-specific physical activity and mental health: A meta-analysis. *American Journal of Preventive Medicine, 52*, 653-666. doi: 10.1016/j.amepre.2016.12.008

Wicker, P., & Frick, B. (2015). The relationship between intensity and duration of physical activity and subjective well-being. *European Journal of Public Health, 25*, 868-872. doi: 10.1093/eurpub/ckv131

World Health Organisation. (1998). *The WHO Health Promotion Glossary*. Retrieved from http://www.who.int/

World Health Organization. (2008). *2008-2013 Action plan for the global strategy for the prevention and control of noncommunicable diseases.* Retrieved from http://www.who.int/nmh/publications/

World Health Organization. (2013). *WHO global plan of action on workers' health (2008-2017): Baseline for implementation.* Retrieved from http://www.who.int/

Wulsin, L., & Singal, B. (2003). Do depressive symptoms increase the risk for the onset of coronary heart disease? A systematic quantitative review. *Psychosomatic Medicine, 65*, 201-210. doi: 10.1097/01.PSY.0000058371.50240.E3

Xanthopoulou, Bakker, A., Demerouti, E., & Schaufeli, W. (2007). The role of personal resources in the job demands-resources model. *International Journal of Stress Management, 14*, 121-141. doi: 10.1037/1072-5245.14.2.121

Xanthopoulou, D., Bakker, A., & Fischbach, A. (2013). Work engagement among employees facing emotional demands: The role of personal resources. *Journal of Personnel Psychology, 12*, 74-84. doi: 10.1027/1866-5888/a000085

Xanthopoulou, D., Bakker, A., Demerouti, E., & Schaufeli, W. (2009). Work engagement and financial returns: A diary study on the role of job and personal resources. *Journal of Occupational and Organizational Psychology, 82*, 183-200. doi: 10.1348/096317908X285633

Xanthopoulou, D., Bakker, A., Demerouti, E., & Schaufeli, W. (2007a). The role of personal resources in the job demands-resources model. *International Journal of Stress Management, 14*, 121-141. doi: 10.1037/1072-5245.14.2.121

Xanthopoulou, D., Bakker, A., Dollard, M., Demerouti, E., Schaufeli, W., Taris, T., & Schreurs, P. (2007b). When do job demands particularly predict burnout? The moderating role of job resources. *Journal of Managerial Psychology, 22*, 766-786. doi: 10.1108/02683940710837714

Yancey, A., Pronk, N., & Cole, B. (2007). Workplace approaches to obesity prevention. In S. K. Kumanyika & R. C. Brownson (Eds.), *Handbook of obesity prevention: A resource for health professionals* (pp. 317-347). New York, NY: Springer.

Yang, X., Telama, R., Hirvensalo, M., Hintsanen, M., Hintsa, T., Pulkki-Råback, L., & Viikari, J. (2010). The benefits of sustained leisure-time physical activity on job strain. *Occupational Medicine, 60*, 369-375. doi: 10.1093/occmed/kqq019

Yang, Z., Yang, Z., Zhu, L., & Qiu, C. (2011). Human behaviors determine health: Strategic thoughts on the prevention of chronic non-communicable diseases in China. *International Journal of Behavioral Medicine, 18*, 295-301. doi: 10.1007/s12529-011-9187-0

Yeo, G., & Neal, A. (2004). A multilevel analysis of effort, practise, and performance: Effects of ability, conscientiousness, and goal orientation. *Journal of Applied Psychology, 89*, 231-247. doi: 10.1037/0021-9010.89.2.231

Zaharna, M., & Guilleminault, C. (2010). Sleep, noise and health: Review. *Noise Health, 12*, 64-69. doi: 10.4103/1463-1741.63205

Zakerian, S., & Subramaniam, I. (2009). The relationship between psychosocial work factors, work stress and computer-related musculoskeletal discomforts among computer users in Malaysia. *International Journal of Occupational Safety and Ergonomics, 15*, 425-434. doi: 10.1080/10803548.2009.11076822

Zhai, L., Zhang, H., & Zhang, D. (2015). Sleep duration and depression among adults: A meta-analysis of prospective studies. *Depression and Anxiety, 32*, 664-670. doi: 10.1002/da.22386

Zheng, C., Kashi, K., Fan, D., Molineux, J., & Ee, M. (2015). Impact of individual coping strategies and organisational work-life balance programmes on Australian employee well-being. *The International Journal of Human Resource Management, 27*, 501-526. doi: 10.1080/09585192.2015.1020447

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Appendices

Appendix A – Results list for each of the databases the search term ‘job demands resources model’ was applied in Chapter II.

Database	Number of results
CINAHL	106
PubMed	241
PsychINFO	4,407
PsychArticles	80
Scopus	1,466
Web of Science	2,021

Appendix B – A list of articles identified as relevant to Chapter II main RQ after removing duplicates and screening articles by title and abstract (*studies that were included in the review).

Author(s)/Publication year	Article title
Akkermans et al. (2009)	Fresh and healthy?: Well-being, health and performance of young employees with intermediate education
Berger et al. (2008)	Does job satisfaction mediate the relationships between work environment stressors and employee problem drinking?
Bergin & Jimmieson (2014)*	Australian lawyer well-being: Workplace demands, resources and the impact of time-billing targets
Brauchli et al. (2015)	Towards a job demands-resources health model: Empirical testing with generalizable indicators of job demands, job resources, and comprehensive health outcomes
Caroli & Godard (2016)	Does job insecurity deteriorate health?
Clinton et al. (2017)*	It's tough hanging-up a call: The relationships between calling and work hours, psychological detachment, sleep quality, and morning vigor
Colell et al. (2016)	Gender differences in the use of alcohol and prescription drugs in relation to job insecurity. Testing a model of mediating factors
Costa (2014)*	The effects of organizational justice and exercise on the relationship between job stressors and employee health
De Beer et al. (2014)*	Job burnout's relationship with sleep difficulties in the presence of control variables: a self-report study
De Lange et al. (2009)	A hard day's night: A longitudinal study on the relationships among job demands and job control, sleep quality and fatigue
Dicke et al. (2017)	A longitudinal study of teachers' occupational well-being: Applying the job demands-resources model
Ferrie et al. (2001)	Job insecurity in white-collar workers: Toward an explanation of association with health
Fodor et al. (2014)*	Healthy eating at different risk levels for job stress: Testing a moderated mediation
Fortunato & Harsh (2006)	Stress and sleep quality: The moderating role of negative affectivity
Frone (2016)*	Work stress and alcohol use: developing and testing a biphasic self-medication model
Gadinger et al. (2009)	Female executives are particularly prone to the sleep-disturbing effect of isolated high-strain jobs: A cross-sectional study in German-speaking executives
Giahi et al. (2015)	Visual display terminal use in Iranian bank tellers: Effects on job stress and insomnia
Gosling et al. (2014)	The influence of job stress, social support and health status on intermittent and chronic sleep disturbance: An 8-year longitudinal analysis
Hagger et al. (2009)	The strength model of self-regulation failure and health-related behaviour
Hanson et al. (2011)	Cross-lagged relationships between workplace demands, control, support, and sleep problems
Häusser & Mojzisch (2017)	The physical activity-mediated Demand-Control (pamDC) model: Linking work characteristics, leisure time physical activity, and well-being

(Appendix B list of articles continued)

Author(s)/Publication year	Article title
Kinnunen et al. (2017)	Identifying long-term patterns of work-related rumination: Associations with job demands and well-being outcomes
Knudsen et al. (2007)	Job stress and poor sleep quality: Data from an American sample of full-time workers
Kouvonen et al. (2005)	Job strain and leisure-time physical activity in female and male public sector employees
Kouvonen et al. (2005)	Work stress, smoking status, and smoking intensity: An observational study of 46,190 employees
Kouvonen et al. (2007)	Job strain and adverse health behaviors: The Finnish public sector study
Kouvonen et al. (2009)	Relationship between job strain and smoking cessation: The Finnish Public Sector Study
Lallukka et al. (2008)	Associations of job strain and working overtime with adverse health behaviors and obesity: Evidence from the Whitehall II Study, Helsinki Health Study, and the Japanese Civil Servants Study
Lima et al. (2013)	Job strain, hazardous drinking, and alcohol-related disorders among Brazilian bank workers
Lin (2012)	Work environment and psychosocial factors affecting physical activity among Taiwanese information technology professionals
Liu et al. (2017)*	Eating your feelings? Testing a model of employees' work-related stressors, sleep quality, and unhealthy eating
Loft & Cameron (2014)	The importance of sleep: Relationships between sleep quality and work demands, the prioritization of sleep and pre-sleep arousal in day-time employees
Magnusson et al. (2016)	Longitudinal mediation modeling of unhealthy behaviors as mediators between workplace demands/support and depressive symptoms
Mäkelä et al. (2014)*	The relationship between international business travel and sleep problems via work-family conflict
Malinauskiene et al. (2011)	Associations between self-rated health and psychosocial conditions, lifestyle factors and health resources among hospital nurses in Lithuania
Mayerl et al. (2017)*	The moderating role of personal resources in the relationship between psychosocial job demands and health: a cross-sectional study
Miró et al. (2007)	Relationship between burnout, job strain, and sleep characteristics
Moore (2010)	The relationship between exercise and job related outcomes
Morassaei & Smith (2011)	Examining the relationship between psychosocial working conditions, physical work demands, and leisure time physical activity in Canada
Muraven et al. (2005)	Daily fluctuations in self-control demands and alcohol intake
Nielsen et al. (2015)	Job demands and alcohol use: Testing a moderated mediation model
Nishitani & Sakakibara (2006)	Relationship of obesity to job stress and eating behavior in male Japanese workers
Oshio et al. (2016)	The association between job stress and leisure-time physical inactivity adjusted for individual attributes: Evidence from a Japanese occupational cohort survey

(Appendix B list of articles continued)

Author(s)/Publication year	Article title
Parkes (2017)	Work environment, overtime and sleep among offshore personnel
Pascual et al. (2003)	Job conditions, coping and wellness/health outcomes in Spanish secondary school teachers
Patel (2011)	Using generalized estimating equations to analyze alcohol consumption and job displacement among older workers
Payne et al. (2002)	The impact of working life on health behavior: The effect of job strain on the cognitive predictors of exercise
Payne et al. (2005)	The impact of job strain on the predictive validity of the theory of planned behaviour: An investigation of exercise and healthy eating
Peretti-Watel et al. (2009)	Working conditions, job dissatisfaction and smoking behaviours among French clerks and manual workers
Pisanti et al. (2003)	Occupational stress and wellness among Italian secondary school teachers
Pomaki & Anagnostopoulou (2003)	A test and extension of the Demand/Control/Social support model: Prediction of wellness/health outcomes in Greek teachers
Rosario-Hernandez et al. (2015)	Job demands and its effect to sleep well-being: The mediating role of work-related rumination
Rothmann & Essenko (2007)	Job characteristics, optimism, burnout, and ill health of support staff in a higher education institution in South Africa
Rowe et al. (2015)	The impact of job strain on smoking cessation and relapse in the Canadian population: A cohort study
Rugulies et al. (2008)	Associations between psychological demands, decision latitude, and job strain with smoking in female hotel room cleaners in Las Vegas
Sann (2003)	Job conditions and wellness of German secondary school teachers
Sapp et al. (2010)	Does workplace social capital buffer the effects of job stress? A cross-sectional, multilevel analysis of cigarette smoking among U.S. manufacturing workers
Shirom et al. (2009)	The effects of job strain on risk factors for cardiovascular disease
Smith et al. (2008)	Do changes in job control predict differences in health status? Results from a longitudinal national survey of Canadians
Sonnentag et al. (2006)	Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue
Tsutsumi et al. (2003)	Association between job characteristics and health behaviors in Japanese rural workers
Van Laethem et al. (2017)	Perseverative cognition as an explanatory mechanism in the relation between job demands and sleep quality
Verhoeven et al. (2003)	Job conditions and wellness/health outcomes in Dutch secondary school teachers
Wilson et al. (2016)	The role of working hours, work environment and physical leisure activity on the need for recovery following a day's work among UK white-water raft guides: A within-subjects multilevel approach

(Appendix B list of articles continued)

Author(s)/Publication year	Article title
Yang et al. (2010)	The benefits of sustained leisure-time physical activity on job strain

Appendix C – Information extracted from Chapter II studies identified as relevant to RQ4 after removing duplicates and screening articles by title and abstract (*studies that were included in the scoping review).

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Akkermans et al. (2009)	Netherlands	To gain more insight into the well-being, health and performance of young intermediate educated employees.	Cross-sectional	Job demands, job resources, emotional exhaustion, job satisfaction, general health, in-role performance	Young intermediate educated employees report less demands compared to their high-educated counterparts (though these demands have an effect on well-being and performance), as well as less resources that are important predictors of health and performance.
Berger et al. (2008)	USA	To test a mediation model of work environment stressors, job satisfaction and employee drinking status.	Cross-sectional	Job stress, job alienation, job satisfaction, individual social vulnerabilities, alcohol misuse	The role of job satisfaction in linking work environment stressors to employee problem drinking was not supported. Several variables of interest (e.g., alienation from work) were found to be associated significantly with problem drinking status.
Bergin & Jimmieson (2014)*	Australia	To examine the types of job demands and resources experienced by Australian lawyers, and the prevalence of a range of psychological outcomes.	Cross-sectional	Job demands, job resources, strain outcomes, alcohol misuse	High billers experienced greater job demands, fewer resources, and greater strain than low billers, as well as more time pressure, viewed their workplace negatively, and experienced more stress in the form of ambiguity and conflict. High billers experienced more stress, more dissatisfaction and less work/life balance.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Brauchli et al. (2015)	Switzerland	To expand the relevant outcomes of the JD-R model by linking it to a generic health development framework predicting more broadly positive and negative health.	Longitudinal	Job demands, job resources, negative health, positive health	Initial evidence was found for the validity of the expanded JD-R health model combining the core idea of the model with the broader concepts of salutogenic and pathogenic health development processes as well as both positive and negative health outcomes.
Caroli & Godard (2016)	France	To estimate the causal effect of job insecurity on health in a sample of men from 22 European countries.	Cross-country	Job demands, individual characteristics, firm characteristics, self-rated health, subjective well-being	When endogeneity of job security is not accounted for, most health outcomes deteriorate. When endogeneity of job security is accounted for, the health-damaging effect of job insecurity is confirmed for a limited subgroup of health outcomes.
Clinton et al. (2017)*	UK	To develop and test a model accounting for the positive and negative effects of intense callings on recovery from work experiences.	Daily diary	Calling intensity, daily work hours, psychological detachment, sleep quality, morning vigour	The study demonstrates associations between intense callings and longer working hours and reduced psychological detachment in the evenings.
Colell et al. (2016)	Spain	To examine the relationship between job insecurity with the use of licit drugs using a theoretical model.	Cross-sectional	Job insecurity, type of contract, stress exposure, house workload, drug use, poor mental health	No differences in the prevalence of job insecurity were found between men and women.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Costa (2014)*	USA	To explore the impact of job stressors on job satisfaction and BMI, and the influence of organisational justice and exercise in those relationships.	Cross-sectional	Job demands, job resources (job control, distributive justice, procedural justice), exercise, BMI, job satisfaction	Higher perceptions of justice were related to higher job satisfaction. Exercise was found to be a moderator to job demands-BMI relation, as well as the relationship between distributive justice and job satisfaction.
De Beer et al. (2014)*	South Africa	To investigate whether significant sleep difficulties are reported when employees experience burnout.	Cross-sectional	Burnout, sleep difficulties, exercise frequency, smoking	Job burnout was found to be significantly associated with employees reporting sleep difficulties, even when controlling for a combination of factors that have been shown to affect sleep.
De Lange et al. (2009)	Netherlands	To examine the relations between job demands, job control, sleep quality and fatigue and the effects of stability and change on the development of sleep quality and fatigue.	Longitudinal	Job demands, job control, sleep quality, fatigue, demand-control histories	The four-wave complete panel study revealed significant effects of job demands and job control on sleep quality and fatigue across a 1-year time lag.
Dicke et al. (2017)	Germany	To test all assumptions of the JD-R model simultaneously in a sample of teachers.	Longitudinal	Job demands, job resources, engagement, exhaustion, occupational commitment	Results revealed significant direct effects of resources on engagement, of demands on strain, and a significant reverse path of engagement on self-efficacy.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Ferrie et al. (2001)	UK	To examine changes in psychosocial work characteristics and health-related behaviours as potential explanations of the job insecurity-health relationship.	Longitudinal	Job demands, job resources, negative affect, health, health-related outcomes, health -related behaviours	Job insecurity was associated with a modest increase in self-report morbidity, whereas chronic job insecurity was associated with some adverse physiological changes. Changes in health-related behaviours associated with either exposure were slight.
Fodor et al. (2014)	Germany	To examine the contribution of risk factors associated with job stress to the intention-planning fruit and vegetable consumption relationship.	Longitudinal	Job demands, job resources, fruit and vegetable consumption	A significant moderation of the intention-planning association by risk factors for job stress was found, both for action and for coping planning. Employees with the intention to eat recommended amounts of fruits and vegetables who are working under stress engaged in action and coping planning.
Fortunato & Harsh (2006)	USA	To examine the influence of two personality variables and three work-related stressors on a multi-dimensional measure of sleep quality.	Cross-sectional	Affectivity, stressors, sleep	Personality and work-related stress influences different aspects of sleep quality, namely, sleep quality was negatively related with interpersonal conflict, work demands, and job ambiguity; and negative affectivity moderated the relationships between interpersonal conflict and sleep quality and between perceived ambiguity and sleep quality.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Frone (2016)	USA	To test a model of work stress and alcohol use, based on the biphasic effects of alcohol and the self-medication and stress vulnerability models of use.	Cross-sectional	Job demands, negative affect, work fatigue, alcohol outcome expectancies, alcohol use	Work stressor exposure was conditionally related via negative affect to heavy alcohol use among both men and women holding strong tension-reduction alcohol expectancies and to after work alcohol use among men holding strong tension-reduction alcohol expectancies.
Gadinger et al. (2009)	Germany	To assess the main, curvilinear, interactive and gender-dependent effects of job demands, job control and social support in the prediction of sleep.	Cross-sectional	Job demands, job resources, sleep quality	An interaction of job demands, job control and social support confirms the buffering effect of high job control and high social support on high job demands. This interaction of the JDCS dimensions is moderated by gender as indicated by a significant four-way interaction.
Giahi et al. (2015)	Iran	To determine the relationship between duration of visual display terminals (VDT) use and insomnia among bank tellers.	Cross-sectional	VDT use, sleep disorders	It seems that the low levels of stress and job satisfaction reduce the impact of VDT on sleep quality in tellers who worked less than 6 hours per day.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Gosling et al. (2014)	Australia	To determine the role of health status and social support in the relationship between job stress and sleep disturbance, for both intermittent and chronic disturbance.	Longitudinal	Job demands, job resources, physical health, mental health, sleep disturbance	Perceived lack of job marketability increased risk of intermittent sleep disturbance. Poorer mental and physical health status, represented a significantly greater increase in the odds for chronic sleep disturbance over and above intermittent disturbance.
Hagger et al. (2009)	UK	This review presents the strength model of self-control as a framework to explain self-regulation in health-related behaviour contexts.	Theoretical	None	The authors advocate techniques to improve self-control strength through rest and training on self-control tasks. Suggestions on how these techniques can be integrated into health-related behaviour-change interventions are provided.
Hanson et al. (2011)	Sweden	To examine the longitudinal, bidirectional relationships between work characteristics and sleep problems.	Longitudinal	Job demands, job resources, physical strain, sleep disturbances	Results show a weak relation between demands at T1 and sleep disturbances at T2, a reverse relationship from support T1 to sleep disturbances T2, and associations work characteristics-sleep problems relations.
Häusser & Mojzisch (2017)	Germany	To introduce the physical activity-mediated Demand–Control model as a new theoretical framework.	Theoretical	None	The authors present propositions on how work characteristics affect leisure-time physical activity, health, and wellbeing and discuss the theoretical foundations.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Kinnunen et al. (2017)	Finland	To identify patterns of affective rumination, problem-solving pondering, and lack of psychological detachment from work during off-job time.	Longitudinal	Job demands, job exhaustion, work-related rumination, work engagement	Through (LPA), five stable long-term patterns of rumination were identified: no rumination, moderate detachment from work, moderate rumination combined with low detachment, affective rumination, and problem solving pondering, both combined with low detachment.
Knudsen et al. (2007)	USA	To consider past-month poor sleep quality (days the respondent had difficulty initiating sleep, difficulty maintaining sleep, and nonrestorative sleep).	Cross-sectional	Job demands, job resources, depression, sleep problems	Work overload was positively associated with the frequency of poor sleep quality. Role conflict was positively associated with difficulty initiating sleep and non-restorative sleep. Repetitive tasks were associated with more days of difficulty initiating sleep and maintaining sleep.
Kouvonen et al. (2005)	Finland	To examine the association between job strain and leisure-time physical activity in a large sample of employees.	Cross-sectional	Job demands, job resources, job strain, leisure-time physical activity, smoking, heavy drinking	Findings suggest an independent, albeit substantially weak, association between higher work stress and lower leisure time physical activity.
Kouvonen et al. (2005)	Finland	To examine the relation between work stress and smoking.	Cross-sectional	Job demands, job resources, job strain, smoking	Work stress-smoking associations emphasises the potential benefits of modifying stressful features of work environment in future smoking cessation programs.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Kouvonen et al. (2007)	Finland	To explore the association between job strain and the co-occurrence of smoking, heavy drinking, obesity, and physical inactivity.	Cross-sectional	Job demands, job resources, job strain, smoking, heavy drinking, physical inactivity	Job strain conditions may be associated with the co-occurrence of adverse health behaviours that contribute to preventable chronic diseases.
Kouvonen et al. (2009)	Finland	To examine whether job strain is related to smoking cessation.	Longitudinal	Job demands, job resources, job strain, smoking cessation	Smoking cessation may be less likely in workplaces with high strain and low control. Policies addressing employee job strain and control might contribute to smoking cessation interventions.
Lallukka et al. (2008)	Britain, Finland, & Japan	To examine associations between job strain, adverse health behaviours, among employees of three national studies.	Cross-sectional, cross-country	Job demands, job resources, job strain, unhealthy food habits, physical inactivity, heavy drinking, smoking	Job strain and working overtime had some, albeit mostly weak and inconsistent, associations with adverse health behaviors and obesity in these middle-aged white-collar employee cohorts from Britain, Finland, and Japan.
Lima et al. (2013)	Brazil	To assess the association between high job strain and drinking behaviors among bank workers.	Cross-sectional	Job demands, job resources, alcohol misuse	High job strain was associated with hazardous drinking; the association with alcohol-related disorders was equivocal. For hazardous drinking, an interaction between high demands and low control, as posited by Karasek, was observed.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Lin (2012)	Taiwan	To examine relationships among work environment, psychosocial factors, and physical activity in IT professionals.	Cross-sectional	Job demands, job resources, physical activity	Workplace physical activity interventions directed toward individuals' self-efficacy and outcome expectations in the context of supportive environments may be useful.
Liu et al. (2017)*	China	To examine the relationships between work-related stressors, sleep quality, negative mood, and eating behaviours.	Daily diary	Job demands, healthy and unhealthy food consumption, sleep quality	The findings indicate that the buffering effect of sleep quality was channelled through employees' vigour in the morning, which subsequently weakened the effect of customer mistreatment on negative mood.
Loft & Cameron (2014)	New Zealand	To investigate whether work-related demands and prioritizing sleep predicted sleep behaviour over time.	Daily diary	Job demands, job resources, general mental distress, sleep prioritisation, pre-sleep arousal, sleep behaviour and quality	Findings revealed that high priority for sleep and positive emotions at work may promote sleep quality, whereas cognitive and emotional demands, or pre-sleep arousal may disrupt sleep patterns.
Magnusson et al. (2016)	Sweden	To estimate the indirect/mediated effect of health behaviours in the longitudinal work characteristics-depression relationship.	Longitudinal	Job demands, job resources, health, health-related complaints, current smoking, excessive alcohol consumption, diet, physical activity	Findings conclude that changes in unhealthy behaviours over a period of two years are unlikely to act as strong intermediaries in the longitudinal relationship between job demands and depressive symptoms and between social support and depressive symptoms.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Mäkelä et al. (2014)*	Finland	To explore the relationships between international business traveling, work-family conflict, and health issues.	Longitudinal	International business travel, work-family conflict, sleep problems	While international business travel did not predict sleep problems over time, did increased work-family conflict which in turn increased sleep problems (and functioned as a mediator in the relationship between business travel and subsequent sleep problems).
Malinauskiene et al. (2011)	Lithuania	To investigate the association between health and psychosocial factors; health behaviours; mental distress; job satisfaction; and sense of coherence in a representative sample of nurses.	Cross-sectional	Job demands, job resources, mental distress, job satisfaction, smoking, alcohol consumption, low physical activity	The results of the fully adjusted model showed that age, high job demands, low job control, low social support at work, life threatening events, low physical activity, being overweight, obesity, mental distress, job dissatisfaction and weak sense of coherence were associated with negative self-rated health.
Mayerl et al. (2017)*	Austria	To investigate the effects of physical, mental, and social resources in the relationship between psychosocial job demands and health symptoms, mental strain, and BMI.	Cross-sectional	Job demands, job resources, personal resources, health symptoms, health behaviour, mental strain	A robust association between psychosocial job demands and health symptoms as well as mental strain was revealed, but only a weak relationship between psychosocial job demands and BMI.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Miró et al. (2007)	Spain	To analyse the relationship between sleep, burnout, and job strain in a sample of healthy workers from various professional sectors.	Cross-sectional	Job strain, burnout, sleep quality	Sleep quality explains the variance in emotional exhaustion than the variance explained by job demands. Sleep quality interacts with aspects of job strain in its influence on the dimensions of burnout.
Moore (2010)	USA	To examine the effect of exercise on stress and self-efficacy, and the impact stress and self-efficacy had on job satisfaction and absenteeism.	Cross-sectional	Stress, self-efficacy, job satisfaction, absenteeism, fitness levels	The study has determined that higher levels of fitness may have a positive influence on employees and their job related outcomes. These findings add to the notion and importance of implementing health and wellness programs within organizations.
Morassaei & Smith (2011)	Canada	To examine the effects of psychosocial working conditions and physical work demands on physical activity.	Cross-sectional	Job demands, job resources, sense of mastery, leisure time physical activity	The results support the influence of the work environment on leisure time physical activity and suggest that certain work conditions be targeted in future interventions seeking to impact participation in physical activity.
Muraven et al. (2005)	USA	To test the self-control strength model's predictions in a sample of underage social drinkers.	Ecological momentary assessment	Trait self-control, intentions to drink, end-drinking	There was no relationship between self-control demands and urge or intention to drink, nor were self-control demands related to plans to limit drinking.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Nielsen et al. (2015)	Norway	To determine how and when job demands are related to alcohol use among employees.	Cross-sectional	Job demands, psychological distress, alcohol use	While job demands and job control are related to alcohol use, they seem to have little direct, indirect, and conditional impact on alcohol use over a two-year time period.
Nishitani & Sakakibara (2006)	Japan	To examine the relation between obesity, job stress, and eating behaviour in male workers.	Cross-sectional	Physical stress, psychological job demands, eating behaviour	The results suggest that obese male Japanese workers tend to be in a stressful state from high job demands and low job latitudes in the workplace.
Oshio et al. (2016)	Japan	The association between job stress and leisure-time physical inactivity adjusted for individual attributes.	Cross-sectional	Job stress, job demands, leisure time physical inactivity	Job stress, especially high job strain and effort-reward imbalance, was modestly associated with higher risks of physical inactivity, even after controlling for individual time-invariant attributes.
Parkes (2017)	Australia	To examine whether long hours and a demanding work environment combine synergistically in relation to sleep.	Cross-sectional	Overtime, work environment, job type, sleep	Need to further examine the potential health and safety consequences of impaired sleep associated with high overtime rates offshore, and to identify a way to mitigate the adverse effects of overtime by favourable work characteristics.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Pascual et al. (2003)	Spain	To examine the relation between job conditions and wellness/health outcomes in teachers from 11 European countries.	Cross-sectional, cross-country	Job demands, job resources, burnout, job satisfaction	The results confirm the expected relationship between job conditions and wellness/health effects, and reveal the presence of an interaction between coping variables and JDCS model constructs.
Patel (2011)	USA	To compare differences in alcohol consumption among older workers who have experienced job displacement.	Longitudinal	Labour force status, job instability, mental health, alcohol consumption	Being continuously employed, compared to experiencing job displacement, has a protective effect on alcohol consumption. Workers who were not displaced were less likely to report consuming alcohol compared to those were displaced.
Payne et al. (2002)	UK	To investigate exercise in a group of employees using the theory of planned behaviour and the job strain model.	Cohort	Job demands, job control, barriers and facilitators, subjective norm, attitude, exercise	Employees in high-strain jobs did significantly less exercise than those in low-strain jobs, although they did not intend to do less, suggesting that work may impede the intention implementation.
Payne et al. (2005)	UK	To examine the impact of the job strain model on exercise and healthy eating within the framework of the theory of planned behaviour.	Cohort	Job demands, job control, exercise behaviour, healthy eating behaviour, subjective norm, attitude, intention to exercise, intention to eat healthily	Job strain has a more direct impact on healthy eating. Job strain may only affect consumption of so-called 'high density' foods, rather than foods such as fruit and vegetables.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Peretti-Watel et al. (2009)	France	To study the relation between working conditions, job dissatisfaction and smoking behaviours among workers.	Cross-sectional	Job demands, job resources, job satisfaction, smoking status, tobacco dependence	Poor working conditions may heavily contribute to health inequalities, as they are likely to fuel both stress and unhealthy behaviours, which combine to increase morbidity and mortality.
Pisanti et al. (2003)	Italy	To examine the relationship between job conditions and wellness/health outcomes in an Italian sample, and to compare this with European data.	Cross-sectional	Job demands, job resources, job satisfaction, burnout, somatic complaints	Compared to European teachers, Italian teachers manifest a higher degree of personal accomplishment and a lesser degree of depersonalisation, and a lesser degree of social support and a higher degree of somatic complaints.
Pomaki & Anagnostopoulou (2003)	Greece	To investigate the relation between job characteristics, coping strategies and job satisfaction, burnout and somatic complaints in school teachers.	Cross-sectional	Job characteristics, working hours, job satisfaction, burnout, coping	Results indicated that coping variables can explain variance in most of the outcomes included in the study, in addition to all job characteristics. Regarding the additional job characteristics, meaningfulness at work is the most important predictor.
Rosario-Hernandez et al. (2015)	Puerto Rico	To examine the relationship between job demands and sleep well-being in a sample of employees from different organisations.	Cross-sectional	Job demands, work-related rumination, sleep well-being	The results suggest an inverse relationship between job demands and sleep well-being. In addition, work-related rumination mediates the relation between job demands and sleep well-being.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Rothmann & Essenko (2007)	South Africa	To assess the relationships between job characteristics, burnout, optimism, and ill health.	Cross-sectional	Job demands, job resources, burnout, dispositional optimism, health	The results showed that job demands and a lack of resources contributed to burnout. Burnout, in turn, mediated the effects of job demands and a lack of resources on ill health.
Rowe et al. (2015)	Canada	To investigate the impact of job strain on smoking cessation and relapse in a representative general population sample.	Longitudinal	Job demands, job strain, smoking status	Psychosocial work environments may be too diverse for uniform trends in the relationship between job stress and smoking behaviour in a population sample.
Rugulies et al. (2008)	USA	To study the associations between the components of the demand-control model with smoking in hotel room cleaners.	Cross-sectional	Job demands, decision latitude, and job strain, smoking	Effect estimates were reduced when adjusting for ethnicity, but remained significant for high psychological demands and smoking prevalence, high job strain, and smoking prevalence, and high job strain and smoking intensity.
Sann (2003)	Germany	To examine the relation between job conditions of teachers and wellness/health-related outcomes in a sample of teachers.	Cross-sectional	Job demands, job resources, job satisfaction, coping, burnout, somatic symptoms	The study concludes that additional job conditions not yet included in the JDCS model could add an important contribution and that different job conditions are predictive for different outcomes.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Sapp et al. (2010)	USA	To investigate whether workplace social capital buffers the association between job stress and smoking status.	Cross-sectional	Job stress, workplace social capital, smoking status	Workplace social capital buffered associations between high job demands and smoking. Workertrust in managers - buffered associations between job strain and smoking.
Shirom et al. (2009)	Israel	The review focuses on work-related psychological stress.	Theoretical	None	There is basic agreement about the notion that work-related chronic stress may be implicated in cardiovascular disease factors, including physiological ones such as elevated cholesterol and blood pressure levels.
Smith et al. (2008)	Canada	To examine the effect of changes in job control on health behaviours, psychological distress and health.	Longitudinal	Job control, household income agency, psychological distress, health behaviours	The study results suggest that both level of job control and changes in job control have direct and indirect effects on health status over time.
Sonnentag et al. (2006)	Netherlands	To examine the need for recovery as a mediator in the relationship between poor job characteristics and off-job demands, and fatigue and poor individual well-being via two empirical studies.	Daily diary	Job demands, job control, off-job activities, need for recovery, well-being at bedtime	The results from the first study in Germany showed that high job demands, low job control and unfavourable off-job activities predicted a high need for recovery. Need for recovery was negatively related to individual well-being. The same findings were confirmed for fatigue in a representative sample of the Dutch working population.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Tsutsumi et al. (2003)	Japan	To examine associations between job characteristics and health behaviours in rural workers.	Cross-sectional	Job demands, job control, dietary habits, smoking, alcohol consumption	The results of the study showed that job strain was associated with lower vegetable consumption, low prevalence of smoking, and high prevalence of current alcohol drinking.
Van Laethem et al. (2017)	Sweden	To examine associations between job demands, work-related perseverative cognition and sleep quality.	Longitudinal	Job demands, work-related PC, and sleep quality	Results showed that job demands, PC, and poor sleep quality were positively and reciprocally related. Work-related PC mediated the normal and reversed, direct across-wave relations between job demands and sleep quality.
Verhoeven et al. (2003)	Netherlands	To compare the work situation of Dutch secondary school teachers to job conditions of European teachers and to test the JDCS model on burnout, job satisfaction and somatic symptoms.	Cross-sectional, cross-country	Job conditions, burnout, job satisfaction, somatic complaints	Dutch teachers do not differ on job conditions from Europeans except for two working conditions indicating less physical exertion and environmental risks than the European reference sample. Dutch teachers reported fewer somatic complaints and reported higher levels of personal accomplishment.

(Appendix C information extracted continued)

Author(s)/Publication year	Study location	Study aims	Study design	Measures	Important results
Wilson et al. (2016)	UK	To investigate the role of working hours, work environment and physical leisure activity on the need for recovery after a day's work.	Longitudinal	Work environment, need for recovery, number of working hours, number of hours of physical leisure activity	The results indicate that physical leisure activity may provide a distraction from work, allowing employees to replenish their physical and psychological energy, thus protecting themselves against work-related fatigue.
Yang et al. (2010)	Finland	To examine the relationship between leisure-time physical activity and the prevalence of job strain.	Longitudinal	Job demands, job control, job strain, leisure-time physical activity	The study results indicated that participation in regular LTPA during leisure may help young adults to cope with job strain. A long-term benefit of LTPA may play a role in the development of mental well-being.

Appendix D – Judgments on quality and relevance of Chapter II studies that met the criteria using EPPI's Weight of Evidence (WoE) framework (*studies that found to be of high relevance to RQ4).

Author(s)/Publication year	WoE A (Methodological relevance)	WoE B (Evidence relevance)	WoE C (Overall relevance to RQ)
Bergin & Jimmieson (2014)	High	Low	Low
Clinton et al. (2017)	Low	Low	Low
Costa (2014)	Low	Low	Low
De Beer et al. (2014)*	High	High	High
Fodor et al. (2014)	Low	Low	Low
Frone (2016)*	High	High	High
Liu et al. (2017)	High	Low	Low
Mäkelä et al. (2014)	Low	Low	Low
Mayerl et al. (2017)	Low	Low	Low

Appendix E – Different versions of Chapter III study flyer used for recruiting participants on Curtin University's campus and online (e.g., Curtin University's email newsletter, LinkedIn).

How does your lifestyle influence your work?

We are looking for adult workers in typically stationary occupations (e.g., office jobs) to take part in a study exploring the associations between a number of lifestyle behaviours and a range of work outcomes as part of a PhD project.

We simply ask that you fill in an anonymous online survey (takes on average 15 minutes to complete).

Please follow the link below to complete the survey. For more information follow this link https://goo.gl/AoHYAx or contact Dimitri on dimitrios.adam@postgrad.curtin.edu.au

https://goo.gl/bMsI8s	https://goo.gl/bMsI8s	https://goo.gl/bMsI8s	https://goo.gl/bMsI8s	https://goo.gl/bMsI8s	https://goo.gl/bMsI8s	https://goo.gl/bMsI8s	https://goo.gl/bMsI8s	https://goo.gl/bMsI8s

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(Appendix E continued)

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For more information follow this link:
https://goo.gl/bMsI8s

If you have any further questions or concerns please contact Dimitri on dimitrios.adam@postgrad.curtin.edu.au

(Appendix E continued)

My PhD project: Health behaviours and work-related outcomes

Published on January 20, 2018 Edit article | View stats

Dimitri Adam
PhD Researcher
1 article

164 7 2

I'm looking to work with *organisations* and *employees* as part of my PhD project. Information on the project and ways to get in touch are shown below.

Please note that eligibility for some of the studies (i.e., studies 2 and 3) as well as incentives can only be offered to organisations based in Australia.

What? Employee health and well-being is critical to business success. Past research has shown individual employee health behaviours (e.g., moderate to high physical activity, high fruit/vegetable intake) to be associated with positive work-related outcomes (e.g., high work engagement, high productivity), whereas poor employee health and well-being has consistently been linked to negative work-related outcomes (e.g., absenteeism, presenteeism) and high organisational costs. We're interested in developing an understanding of how a range of health behaviours may contribute to individual health, well-being and work-related outcomes of importance to business and individuals alike.

How? This project consists of three studies; employees can participate in the first study only if they wish, but will also be informed of the two follow-up studies they can participate in which examine the short- (daily) and long-term (every 3 months) relations between a combination of health behaviours and work-related outcomes.

(Appendix E continued)

Dimitri Adam

164 7 2

How? This project consists of three studies; employees can participate in the first study only if they wish, but will also be informed of the two follow-up studies they can participate in which examine the short- (daily) and long-term (every 3 months) relations between a combination of health behaviours and work-related outcomes.

1. First, through your organisation's HR department or at the managers' discretion, we will circulate an online link to the first study. This is a web-based survey which will take participants roughly 15 minutes to complete either during or after working hours.

2. Second, approximately six months later, employees who previously indicated they are interested in participating in the follow-up studies will be provided with an Apple iPad so they can complete a daily survey, at the end of each business day for 14 days. Employees will also be asked to wear an activity monitor (called an accelerometer, which looks like a watch and is very stylish and waterresistant) in order to obtain measures of movement. They will use this along with the iPad for a two-week period.

3. Finally, approximately one year later, employees who participated in the first study (but not the second) and indicated they are interested in participating in the follow-up studies will be recruited for this final study. This final study will run for 12 months; however, participants will be able to withdraw at any time. Participants will be asked to fill in a short (approximately 15 mins) web-based survey once every 3 months.

When? We will work with you and your managers to identify a time period when you are happy for your organisation's employees to be contacted and informed about this project.

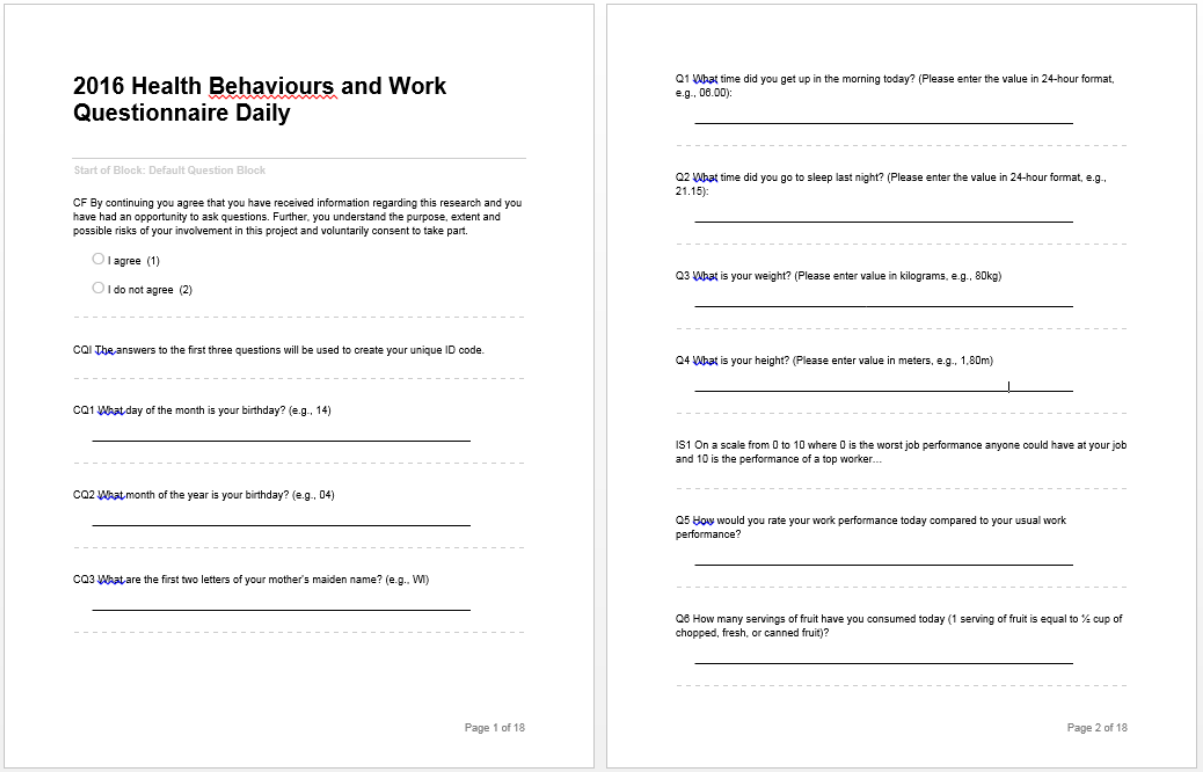
Why? This project is looking at how employee health and well-being is associated with work-related outcomes. A refined understanding of which combination of health behaviours are most conducive to workplace health and well-being can inform workplace policies and practices regarding employee health initiatives.

What's in it for you? Upon completion of the project, you will be informed of the study results and how these are important for your organisation. The investigators are offering a free training session with the management team within their areas of expertise – Dr Daniel Gucciardi is a prominent researcher in mental toughness, Dr Nikos Ntoumanis is a motivation expert, and Dr Thogersen- Ntoumani is an expert in well-being in organisational settings.

I look forward to hearing from you!

Email: dimitrios.adam <at> postgrad.curtin.edu.au

Appendix F – Chapter IV survey hosted on the Qualtrics platform.



2016 Health Behaviours and Work Questionnaire Daily

Start of Block: Default Question Block

CF By continuing you agree that you have received information regarding this research and you have had an opportunity to ask questions. Further, you understand the purpose, extent and possible risks of your involvement in this project and voluntarily consent to take part.

- I agree (1)
- I do not agree (2)

CQI The answers to the first three questions will be used to create your unique ID code.

CQ1 What day of the month is your birthday? (e.g., 14)

CQ2 What month of the year is your birthday? (e.g., 04)

CQ3 What are the first two letters of your mother's maiden name? (e.g., WI)

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Q1 What time did you get up in the morning today? (Please enter the value in 24-hour format, e.g., 06.00):

Q2 What time did you go to sleep last night? (Please enter the value in 24-hour format, e.g., 21.15):

Q3 What is your weight? (Please enter value in kilograms, e.g., 80kg)

Q4 What is your height? (Please enter value in meters, e.g., 1,80m)

IS1 On a scale from 0 to 10 where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker...

Q5 How would you rate your work performance today compared to your usual work performance?

Q6 How many servings of fruit have you consumed today (1 serving of fruit is equal to ½ cup of chopped, fresh, or canned fruit)?

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Q7 How many servings of vegetables have you consumed today (1 serving of vegetables is equal to ½ cup of chopped, fresh, or canned vegetables)?

Q8 Do you consume alcohol?

- Yes (1)
- No (3)

Skip To: Q10 If Do you consume alcohol? = No

IS2
Standard drinks guide

A standard drink is any drink containing 10 grams of alcohol. For example, a 375ml stubbie of full strength beer is equal to 1.5 standard drinks, 100ml of red wine (standard serve) are equivalent to 1 standard drink, and 30ml of a 40% alcohol spirit are equivalent to 1 standard drink.

Q9 How many units of alcohol have you consumed today?

Q10 Do you smoke?

- Yes (1)
- No (3)

Skip To: Q12 If Do you smoke? = No

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Q11 How many cigarettes have you smoked today?

Q12 Did you miss any part of your workday today?

- Yes (1)
- No (2)

Skip To: Q15 If Did you miss any part of your workday today? = No

Q13 How many hours of the workday did you miss today?

- Entire workday (1)
- Part of the workday (please specify in hours, e.g., 2) (2)
- I did not miss any part of the workday (3)

Skip To: EM If How many hours of the workday did you miss today? = Entire workday

Q14 This was due to:

- Vacation/leave (1)
- Your own physical or mental health (2)
- A family member's physical or mental health (3)
- Other (please specify): (4)

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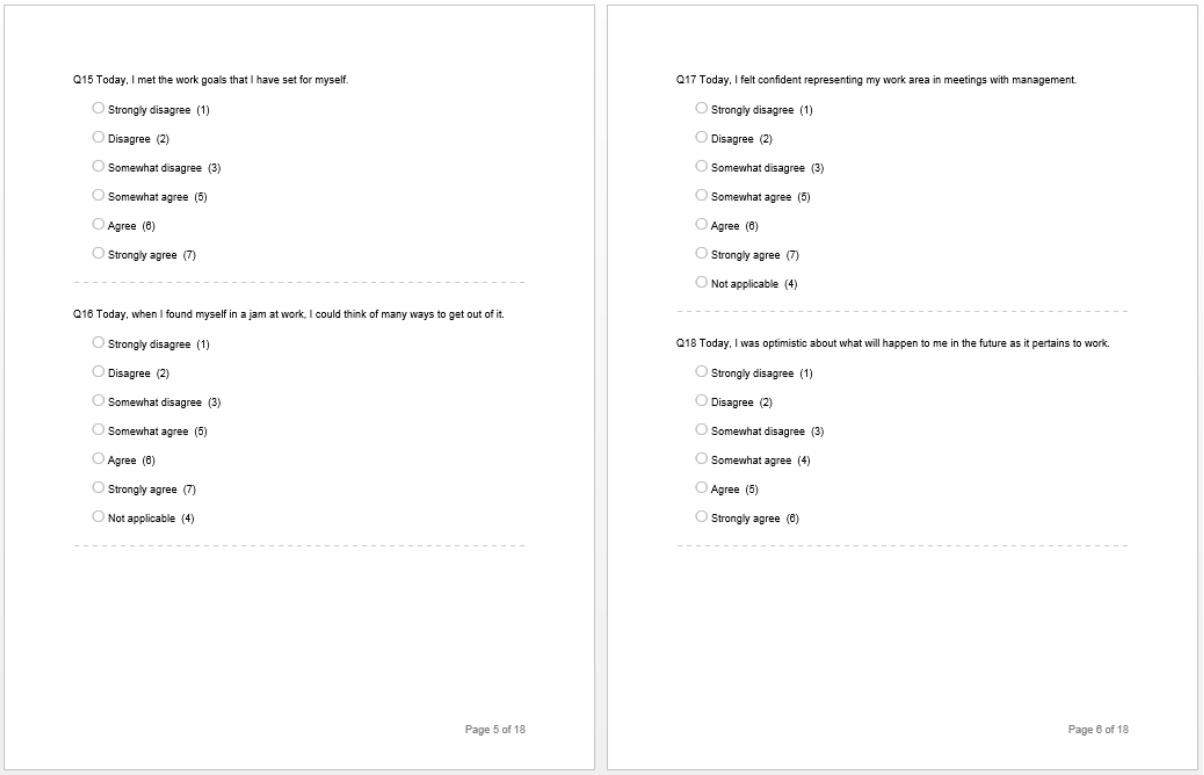
(Appendix F continued)



Q15 Today, I met the work goals that I have set for myself.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Q16 Today, when I found myself in a jam at work, I could think of many ways to get out of it.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
- Not applicable (4)

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Q17 Today, I felt confident representing my work area in meetings with management.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
- Not applicable (4)

Q18 Today, I was optimistic about what will happen to me in the future as it pertains to work.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (4)
- Agree (5)
- Strongly agree (6)

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Q19 Today, I was able to get through difficult times at work because I've experienced difficulty before.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
- Not applicable (4)

Q20 Today, I saw myself as being pretty successful at work.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

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Q21 Today, I felt confident presenting information to a group of colleagues.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
- Not applicable (4)

Q22 Today, I took stressful things at work in my stride.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
- Not applicable (4)

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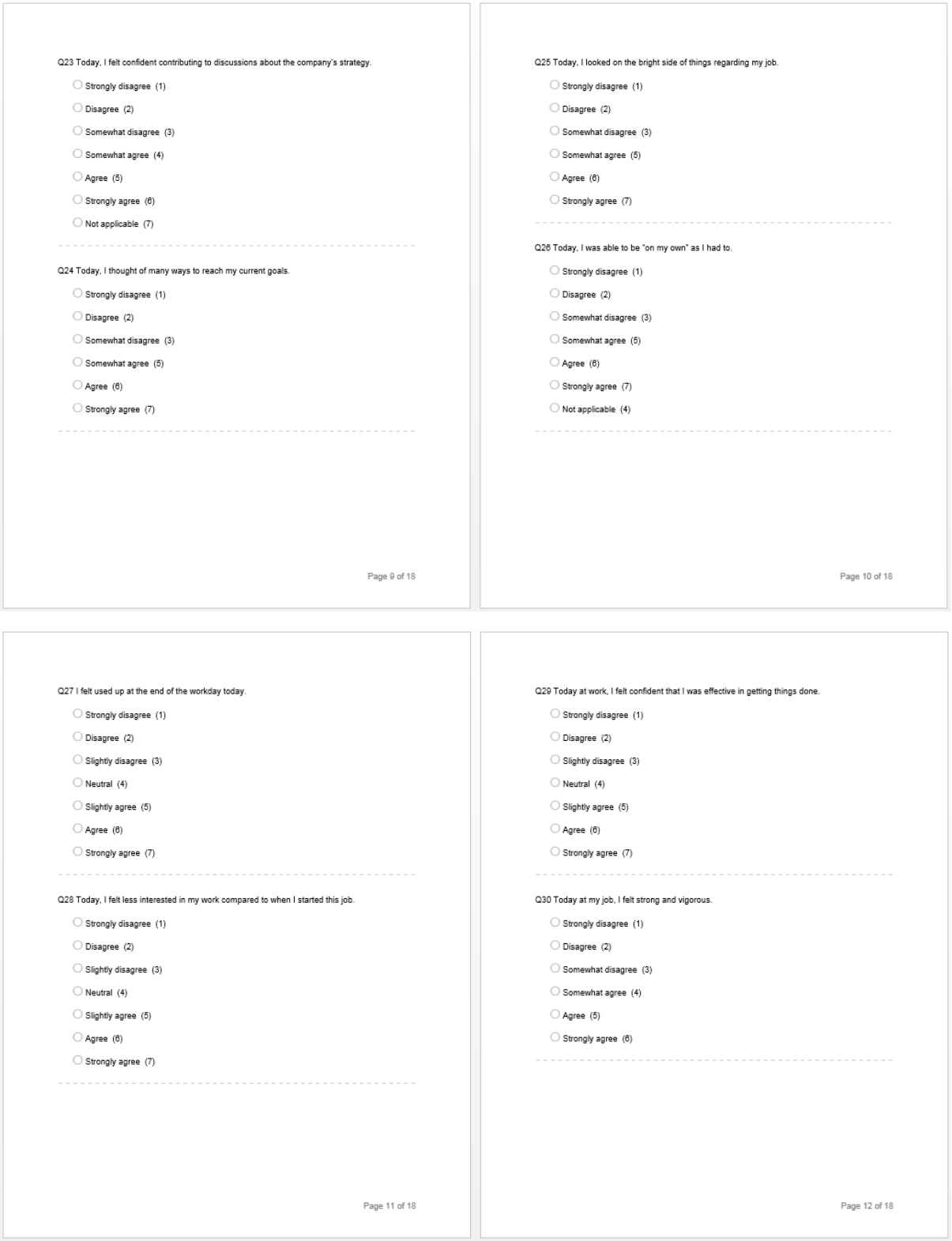
(Appendix F continued)



Q23 Today, I felt confident contributing to discussions about the company's strategy.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (4)
- Agree (5)
- Strongly agree (6)
- Not applicable (7)

Q24 Today, I thought of many ways to reach my current goals.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

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Q25 Today, I looked on the bright side of things regarding my job.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Q26 Today, I was able to be "on my own" as I had to.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
- Not applicable (4)

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Q27 I felt used up at the end of the workday today.

- Strongly disagree (1)
- Disagree (2)
- Slightly disagree (3)
- Neutral (4)
- Slightly agree (5)
- Agree (6)
- Strongly agree (7)

Q28 Today, I felt less interested in my work compared to when I started this job.

- Strongly disagree (1)
- Disagree (2)
- Slightly disagree (3)
- Neutral (4)
- Slightly agree (5)
- Agree (6)
- Strongly agree (7)

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Q29 Today at work, I felt confident that I was effective in getting things done.

- Strongly disagree (1)
- Disagree (2)
- Slightly disagree (3)
- Neutral (4)
- Slightly agree (5)
- Agree (6)
- Strongly agree (7)

Q30 Today at my job, I felt strong and vigorous.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Somewhat agree (4)
- Agree (5)
- Strongly agree (6)

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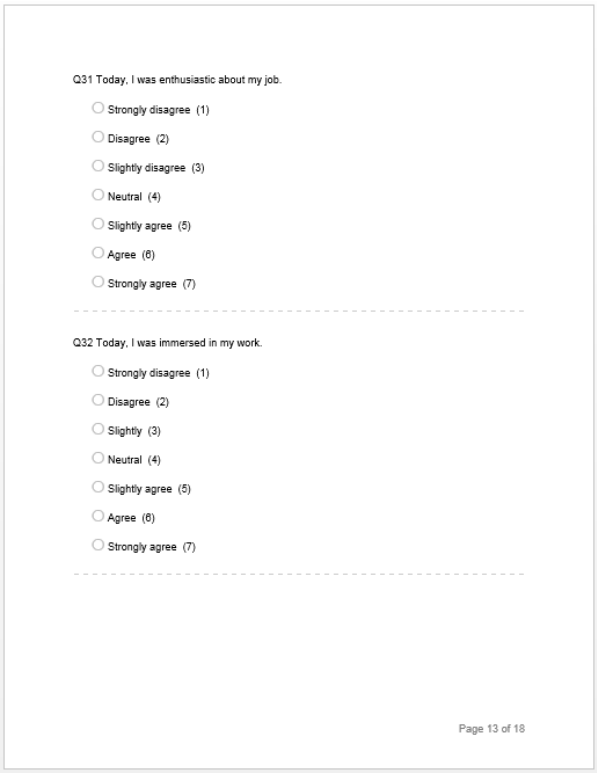
(Appendix F continued)



Q31 Today, I was enthusiastic about my job.

- Strongly disagree (1)
- Disagree (2)
- Slightly disagree (3)
- Neutral (4)
- Slightly agree (5)
- Agree (6)
- Strongly agree (7)

Q32 Today, I was immersed in my work.

- Strongly disagree (1)
- Disagree (2)
- Slightly (3)
- Neutral (4)
- Slightly agree (5)
- Agree (6)
- Strongly agree (7)

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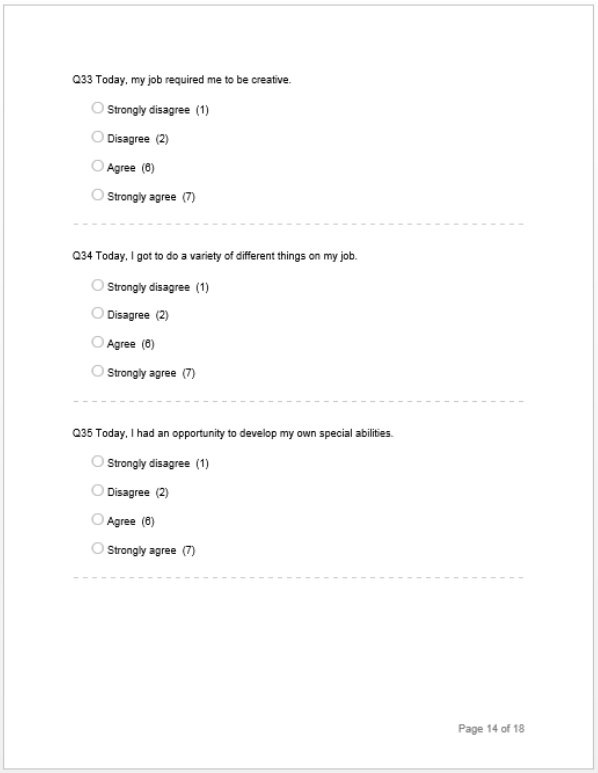

Q33 Today, my job required me to be creative.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)

Q34 Today, I got to do a variety of different things on my job.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)

Q35 Today, I had an opportunity to develop my own special abilities.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)

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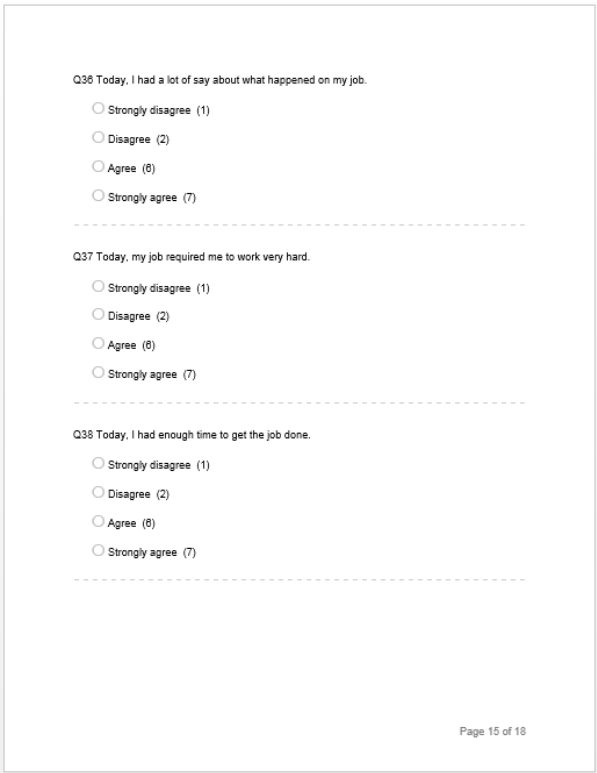

Q36 Today, I had a lot of say about what happened on my job.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)

Q37 Today, my job required me to work very hard.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)

Q38 Today, I had enough time to get the job done.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)

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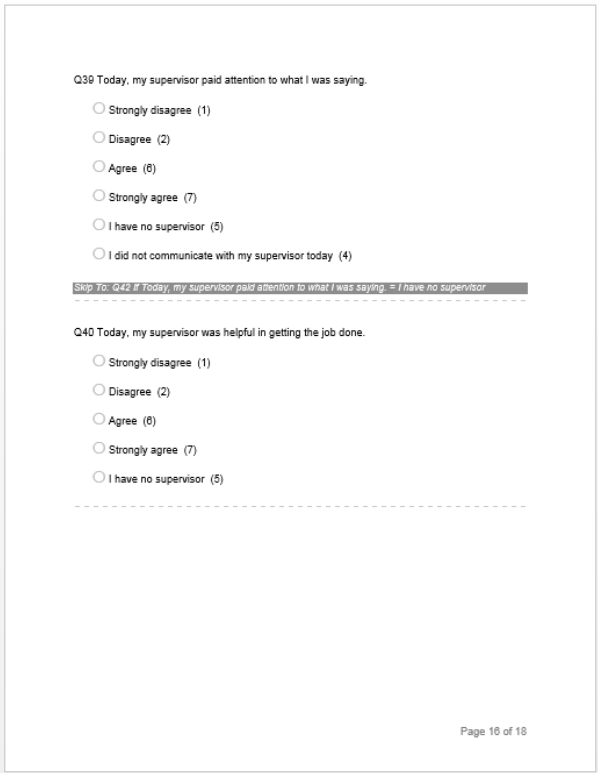

Q39 Today, my supervisor paid attention to what I was saying.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)
- I have no supervisor (5)
- I did not communicate with my supervisor today (4)

Skip To: Q42 If Today, my supervisor paid attention to what I was saying. = I have no supervisor

Q40 Today, my supervisor was helpful in getting the job done.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)
- I have no supervisor (5)

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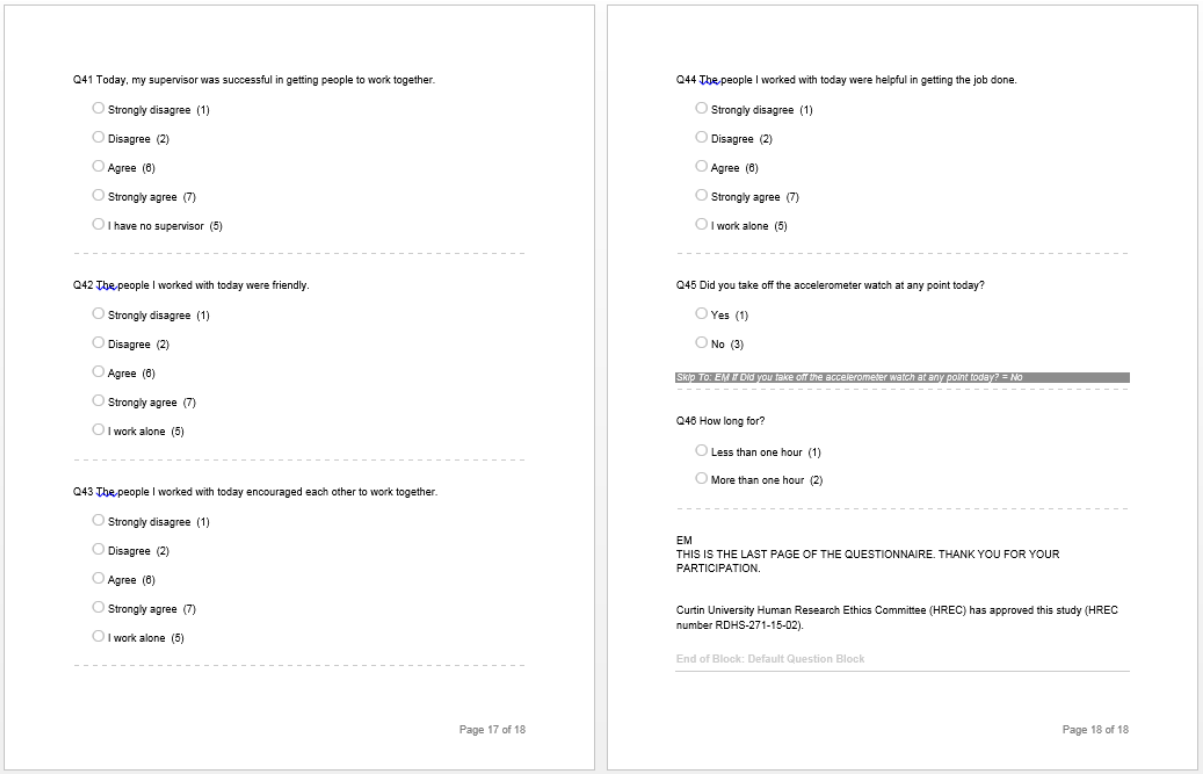
(Appendix F continued)



Q41 Today, my supervisor was successful in getting people to work together.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)
- I have no supervisor (5)

Q42 The people I worked with today were friendly.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)
- I work alone (5)

Q43 The people I worked with today encouraged each other to work together.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)
- I work alone (5)

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Q44 The people I worked with today were helpful in getting the job done.

- Strongly disagree (1)
- Disagree (2)
- Agree (6)
- Strongly agree (7)
- I work alone (5)

Q45 Did you take off the accelerometer watch at any point today?

- Yes (1)
- No (3)

Skip To: EM If Did you take off the accelerometer watch at any point today? = No

Q46 How long for?

- Less than one hour (1)
- More than one hour (2)

EM
THIS IS THE LAST PAGE OF THE QUESTIONNAIRE. THANK YOU FOR YOUR PARTICIPATION.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number RDHS-271-15-02).

End of Block: Default Question Block

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